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Electrical Power Engineering, Smart Grid Trainers

Training systems on the generation, distribution and management of electrical energy:

- Power engineering training system, distribution training system
- Energy generation training system, renewable energy generation training system
- Transformer training system, high-voltage transmission lines training system, protective systems training system
- Energy management training system, smart grid training systems

The Lucas-Nülle training systems have been designed in anticipation of the newest developments:

- Smart measuring instruments provided with various communication interfaces (e.g. LAN, RS485, USB) and control elements
- SCADA Power Engineering Lab software for the intelligent control and evaluation of "smart grids" using Soft PLC
- SCADA software designed for educational purposes
- Permits investigation of dynamically alternating loads and power generation inside the laboratory
- Intelligent energy management
- Modular integration of renewable energies into a smart grid using protective engineering
- Wind power plant with doubly-fed asynchronous generator (DFIG) and synchronisation to the grid
- Interactive multimedia training course

Training systems on the generation, distribution and management of electrical energy:

- Power engineering trainer, distribution trainer
- Energy generation trainer, renewable energy generation trainer
- Transformer trainer, high-voltage transmission lines trainer, protective systems trainer
- Energy management trainer, smart grid trainers

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- Smart measuring instruments which avail of various communication interfaces (e.g. LAN, RS485, USB) and control elements
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- Didactically designed SCADA software
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- Interactive multimedia training course

Renewable Energies



Renewable Energies

The move away from coal, oil and nuclear power to renewable forms of energy is gaining momentum. Today, technology has evolved to a point where solar energy, wind power, hydrogen fuel and biomass can be exploited as environmentally friendly energy sources.

Throughout the world well-qualified technicians and engineers are being sought after to help keep this trend moving forward. Today, technologies are undergoing rapid change. This trend is being compounded by rising expectations in training and education. Lucas-Nülle has developed the appropriate training systems needed to cope with the ever more complex world of training and education.

EPH 3 Professional Photovoltaics Trainer (PV)



EPH 3 Professional Photovoltaics Trainer (PV)

This solar trainer allows the passage of the sun to be simulated realistically. This makes it possible to conduct experiments in the lab in practical fashion without any need for the sun itself. The design of photovoltaic systems operating in parallel with the electric power grid is realistic. In order to stabilise the electricity grid, the techniques of derating the power inverter and controllable local transformers are used.

Knowledge and practical skills along with computer-based assessment of measured data are made possible by the professional photovoltaics multimedia course along with SCADA Power Lab software.

EPH 3.1 Investigation of solar modules



EPH 3.1 Investigation of solar modules

Training contents:

- Recording of module response over days and years
- Testing optimum alignment of solar modules (to increase energy output)
- Recording characteristics of solar modules

Basic equipment set, consisting of:

Basic equipment set, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
1	Solar module with solar altitude emulator	CO3208-1B	1

The solar module rack consists of a polycrystalline solar module and a halogen spotlight as solar simulator. The brightness of the halogen spotlight can be adjusted using a dimmer. Various rooftop angles can be emulated using the tilt adjustment of the solar module allowing these effects on the solar module to be investigated. The halogen spotlight is swivel mounted permitting it to simulate the progression of the sun over a whole day. To be able to emulate the various progressions of the sun over the entire year, the tilt angle of the sun's progression can be adjusted.

Technical data – halogen spotlight:

- Power: 500W
- Power supply: 230 V

Technical data – solar module:

- No-load voltage: 21 V
- Short-circuit current: 650 mA
- Peak power: 10 Wp
- Dimensions: 1200 x 550 x 1100 mm (HxWxD)
- Weight: 10 kg



2 Load unit 1kOhm, 500W

CO3208-1J

1

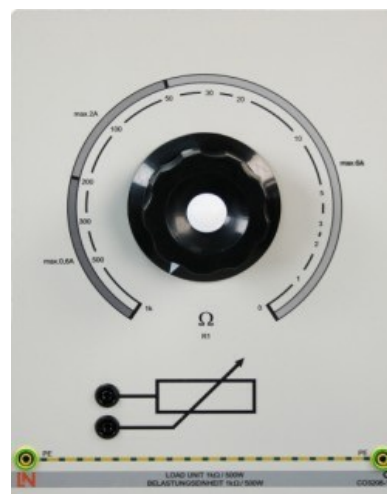
Load resistor for solar module and solar power units.

The resistor can be used with the following:

- Solar module/simulation for recording characteristics and load resistance
- Solar charge regulator as load resistance
- Inverter as load resistor

The solar load is equipped with the following features:

- Resistor: 0...1 kOhm / 500 W continuously adjustable, with stepped winding
- Current:
 - 0 – 50 Ohm max. 6A
 - 51 – 200 Ohm max 2A
 - 201- 1k Ohm max 0.6A
- Connection terminals: 4 mm safety sockets
- Dimensions: 297 x 228 x 160 mm (HxWxD)
- Weight: 4.3 kg



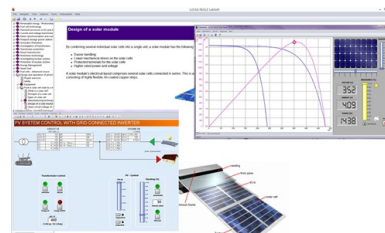
Media:



Pos.	Product name	Bestell-Nr.	Anz.
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3	Interactive Lab Assistant: Professional Photovoltaic Systems	SO2800-3G	1
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The experiment instructions come in the form of an Interactive Lab Assistant course. This multimedia course is a step-by-step guide through the topic of modern photovoltaic energy systems. The physical fundamentals are conveyed using easy to understand animations. The Interactive Lab Assistant in conjunction with the virtual instruments constitutes a comfortable experimenting environment.



Special features:

- Interactive experiment setups
- Measured values and diagrams can be stored in the experiment instructions per drag and drop
- Virtual instruments can be started directly from the experiment instructions
- Includes questions with feedback and evaluation logic for progress monitoring
- Documents can be printed out for hardcopy of experiment instructions including solutions
- CD-ROM with Labsoft browser, course software and virtual instruments
- Course duration 14 h approx.

Software:

Pos.	Product name	Bestell-Nr.	Anz.
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4	Software SCADA Viewer	SO4001-3H	1
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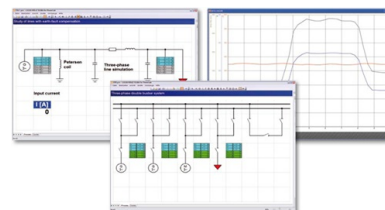
The 'SCADA Viewer' is a software program used for the control and monitoring of power engineering systems. With the software it is possible to display all measured values and operating states inside the system in real time on the existing measuring instruments. Important parameters and signals can be controlled by the software.

The measured values and operating states of the equipment can be selected, recorded and plotted over time, evaluated and then exported.

Using the 'SCADA Viewer' projects in power engineering are not only made transparent but readable.

Software functions:

- Display of measured values and operating states in real time
- Plotting of measured values over time in diagrams
- Processing, analyzing and exporting of diagrams
- The SCADA viewer contains more than 20 predefined projects
- Many projects designed with the SCADA designer can be individually expanded at will



5	Patch cable Cat5E 1x 1m yellow, 2x 2m yellow	LM9057	1
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- 1x 1m yellow
- 2x 2m yellow



6 USB Network Adapter 10/100 BaseTX RJ45

LM9056

1

USB-Ethernet adapter provides simple network access without having to install expansion card. The adapter is thus well-suited especially for cases where there are no more slots available in the PC or the housing should not be opened. This adapter is also an alternative for notebooks: instead of a PC card with an Ethernet port the adapter offers a universal connection option for all PCs with USB interface.



- USB 2.0 high-speed device
- Downward compatible with USB 1.1 and 1.0 Host controllers
- Compatible with IEEE 802.3u, 10/100 Base-T and TX
- Supports both full and half-duplex mode on Ethernet interface
- Operating systems: Windows ME/200/XP/Vista,7 (32+64 Bit), Linux, Mac OS 10.x

7 5-Port Ethernet Switch

LM9988

1

- 5-Port Ethernet Switch
- 5 RJ45 terminals
- Power supply



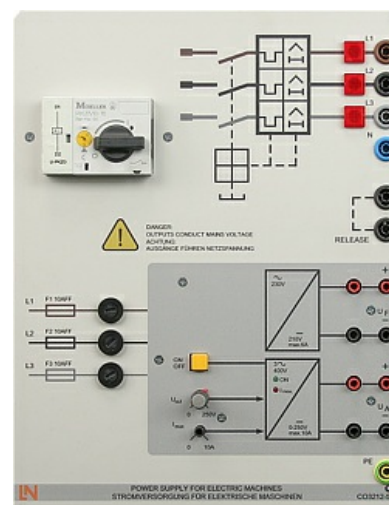
Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
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8	Universal power supply for electrical machines	CO3212-5U	1
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Power supply for DC, AC and three-phase current and for excitation of synchronous machines. The supply is specially designed for use with electrical machines.

- Outputs:
Three phase: L1, L2, L3, N from 4-mm safety sockets
DC: 0...240VDC variable, controlled and electronically protected against overload and short circuits.
Output current: 3...10A (adjustable current limiting)
- Second DC supply ca. 210VDC, 6A fixed
- Protective systems:
Motor protection switch adjustable from 6.3...16A
Undervoltage trip
Safety cut-out
- Power connection: 3x 230/400V, 50/60Hz via CEE plug with 1.8m power lead
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 3kg



9	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1
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Multiple socket outlet, 6 fold, with illuminated switch, 2 pole

- 6 earth pin sockets according to DIN49440, 250V~, 16A
- power cord 1,5m
- Dimensions: 439 x 60 x 44mm (LxWxH)



Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
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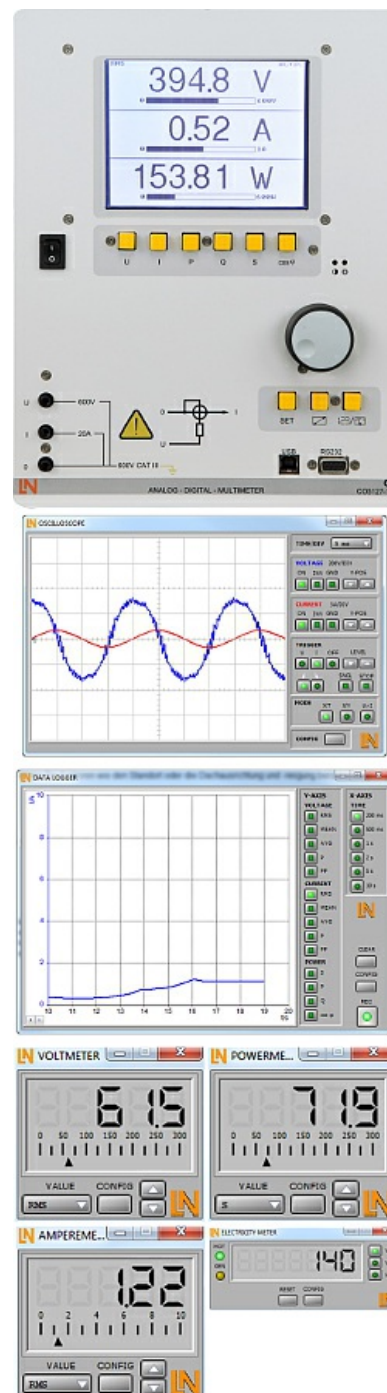
10	Digital/analog multimeter, wattmeter, power-factor incl. software	CO5127-1Z	1
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The areas of electrical machines, power electronics and drive technology pose particular problems for measuring instruments. In addition to high-performance overload protection, the acquisition of measurement values must be performed accurately independently of the curve's shape. The universal measuring device has been designed particularly to satisfy these requirements. It can simultaneously replace as many as four different measuring instruments – constituting a current/voltmeter, power and phase-angle meter all in one. The graphic display allows for both student as well demonstration experiments. The VI Starter software included allows for visualisation of measurements on a PC.

- Simultaneous, measurement of voltage and current independent of the curve shape (max. 600 V, 20 A) (measurement of clocked voltages)
- Calculation of active, apparent and reactive power as well as the power factor
- Measurement of the total rms (RMS-AC+DC), AC rms (RMS-AC) and arithmetic mean (AV-AC+DC)
- Impervious to electrical damage up to 20 A/600 V
- Large-scale, high-contrast background-illuminated graphic display (5.7")
- Large-scale display or display of up to 4 measurement values
- Digital or pseudo-analog display
- USB interface
- Internal resistance: current path 10 mΩ, voltage path 10 MΩ
- Voltage ranges: 30, 300, 600 V
- Current ranges: 1, 10, 20 A
- Measurement accuracy: 2%
- Automatic or manual measurement range selection
- Demonstration test instrument for measuring properties of the electricity supply
- Operating voltage: 230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxBxT)
- Weight: 2kg

The VI Starter software allows all the measurements to be displayed on the PC. Up to 17 different displays can be opened.

- Oscilloscope display of voltage, current and power
- Consumption meter to display power consumed and output
- Data logger for 14 different variables
- Data export for data logger
- Characteristic recorder
- Labview driver and supplied examples
- 32-bit version for Windows



11 Three-phase power quality meter, display and long-term memory

CO5127-1S

1

The three-phase measuring instrument permits the measurement and display of relevant power network parameters. It is able to measure single, two-phase or three-phase measurements. The display and operation is carried out by means of menu navigation with an LC display or the integrated Ethernet interface. The optional SCADA software provides for the display of all measurements and allows the implementation and analysis of intelligent networks (smart grids). The “smart meter” acts as a digital electricity meter where end customers are connected to the grid in order to measure electricity consumption and can be used to turn consumers on or off depending on the circumstances.

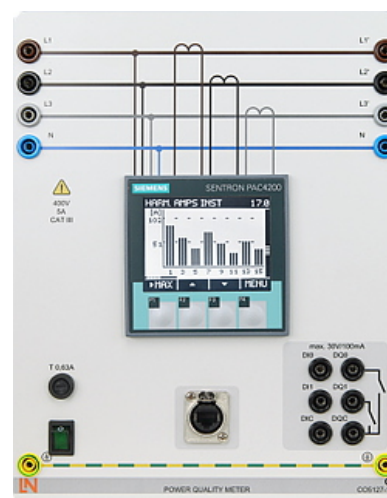
- Three-phase measurement of current and voltage 3x400V/5A
- Measurement of phase voltages, line-to-line voltages and currents
- Determination of the apparent, active and reactive power
- Determination of active, reactive and apparent work
- Determination of the frequency and distortion factors for current and voltage
- Detection of harmonic oscillations and neutral conductor current in the electricity supply
- Pulse measurement
- Peak and mean value detection
- Event logging
- Real-time clock
- Large-scale, contrast-rich graphic display with background illumination
- Display in tables, diagrams and vector diagrams
- 2 Digital inputs and outputs for free configuration including functions
- Ethernet interface
- Menu navigation in German/English/
French/Spanish/Italian/Portuguese/Turkish/
Chinese/Russian/Polish
- Demonstration measuring instrument for making measurements on the electricity supply grid

Max. measurement values:




- Voltage P-P: 690 V
- Current: 5 A

Fault tolerances:

- Voltage 0.2%
- Current 0.2%
- Apparent power 0.5%
- Active power 0.2%
- Reactive power 1%
- Active energy Class 0.2
- Reactive energy Class 2
- Operating voltage: 110V-230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 2kg



Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
12	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	SO5126-3R	20
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour black 		
13	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	SO5126-3V	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour blue 		
14	Safety connecting plug 4mm with tap (2x), green/yellow, 1000V/32A CAT II	SO5126-3W	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour green/yellow 		

15 **Set of safety measurement cables, 4mm (31 leads)**

SO5148-1L

1



Safety measurement cables with 4mm safety plugs, coloured, PVC insulation, highly flexible

Each set includes the following:

- 6 x 25cm long, black
- 4 x 50cm long, black
- 2 x 100cm long, blue
- 2 x 100cm long, red
- 1 x 100cm long, green/yellow
- 1 x 150cm long, blue
- 1 x 150cm long, green/yellow
- 2 x 150cm long, green
- 4 x 150cm long, brown
- 4 x 150cm long, black
- 4 x 150cm long, grey

- Wire cross section 2.5 mm²
- Capacity/category: 600V CAT II, 32A

16 **Mobile aluminium experiment stand, 3 levels, power strip with 6 sockets, 1250x700x1995mm**

ST7200-3A

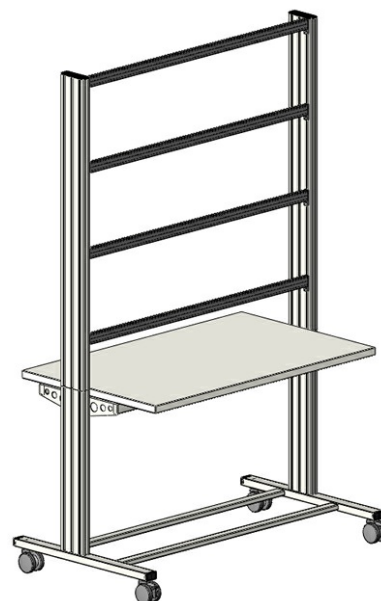
1

High-quality, mobile experiments stand from the SybaPro range for demonstrations and experiments. Features aluminium profile legs compatible with all add-ons and extensions for the SybaPro system.

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.

Table top:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Table top with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug



Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
- 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
- Space for extension of power supply duct
- Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
- Table frame made of tough combination of rectangular tubing around the full perimeter
- Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1995 x 700 mm (WxHxD)

17 Protected power distribution for working stations

ST8008-8M

1

400-V CEE distribution panel with automatic circuit breakers for attachment to profiles on experiment trolleys or direct to table-top.



- 2 CEE sockets (400 V, 16 A, 5-pole) with safety flap
- 1 Socket outlet with earth (230 V) plus safety flap
- Circuit breaker: 1 x 3-pole line circuit breaker, type B, 16 A
- Power connection: 3 x 230/400 V, 50/60 Hz via CEE plug, 4-m power lead
- Dimensions: 530 x 130 x 110 mm (HxWxD)
- Weight: 3 kg

18 Wall or aluminium-profile mounting cable storage for 48 cables

ST8003-8E

1

Accommodates about 48 safety measuring leads (4mm), suitable for mounting on walls or aluminium profiles



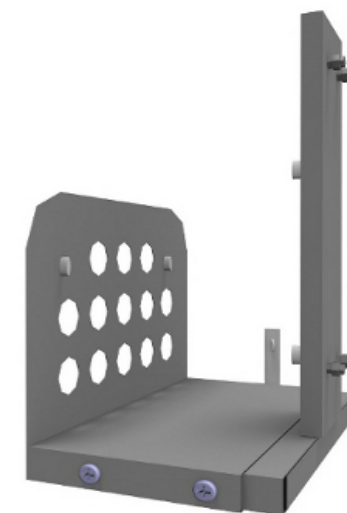
- Width 200 mm, 12 guide grooves for leads
- Adjustable height for mounting on aluminium profiles
- Can be mounted on the left or right
- Can be mounted on walls
- Includes 2 screws and tenon blocks
- Acid-resistant epoxy-resin powder coating, thickness 80 µm approx., colour RAL 7047

19 PC holder for SybaPro experiment trolleys, height/width adjustable

ST7200-5A

1

Shelf for desktop PC made of 1.5mm sheet steel punched with holes, suitable for all furniture in the SybaPro aluminium profile range



- Adjustable assembly height
- Adjustable width (160 - 255mm)
- Can be mounted to left or right
- Includes all equipment necessary for assembly (4 bolts and 4 tenon blocks)
- Acid-resistant epoxy-resin powder coating, 80µm thick approx., colour RAL7047

20 **Monitor holder for flat screen monitor of weight up to 15kg / 33lbs**

ST8010-4T

1

Pivoting monitor holder for attachment to aluminium profiles of furniture in the SybaPro range. Allows a monitor to be placed in the optimum position so that work and experiments are less tiring.



- Pivoting arm with two-part joint
- Quick-lock for adjustment to any height on extruded aluminium profile
- VESA fastening 7.5 x 7.5cm
- Includes VESA 75 (7.5x7.5) - VESA 100 (10x10) adapter
- 2 Cable clips
- Adequate carrying capacity 15kg / 33lbs
- TFT monitor can be turned parallel to the table edge
- Separation can be adjusted to anywhere between 105 and 480mm

Additionally included:

Cable management set for installing cables along the profiles of the aluminium lab system furniture in the SybaPro range, consisting of:

- 3 Cross cable binders for front and rear grooves of aluminium profile
- 3 Cross cable binders for side grooves of aluminium profile
- 12 Cable binders
- 4 Aluminium cover profiles for covering and enabling wires to be run along the grooves of an aluminium profile

21 **Keyboard adapter for flat screen monitor holders**

ST8010-4G

1

Keyboard adapter for use in combination with flat screen monitor holders



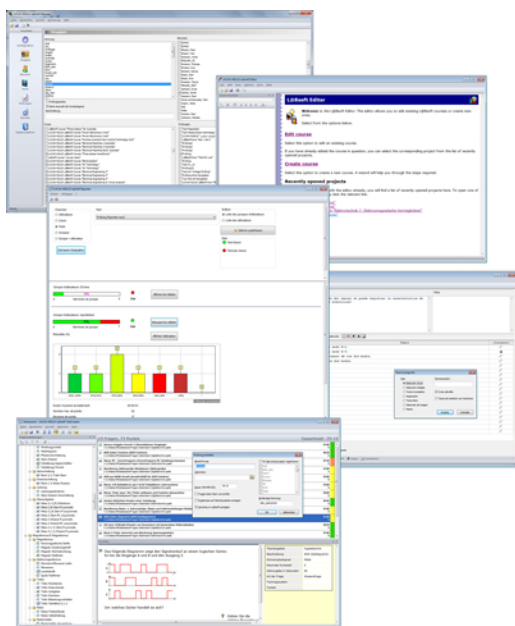
- Mounted between monitor and mount for flat screen monitor holder
- Variable 3-level height adjustment via multiple pre-drilled mounting holes
- Two rows of mounting holes for use with equipment meeting VESA 75 and VESA 100 standards
- Keyboard shelf inclined by about 30° for comfortable and ergonomic usability
- Keyboard shelf with 11-mm folded edging to prevent falling, including handle
- Variable 2-level depth attachment for keyboard shelf (252/276 mm)
- Extra-wide keyboard shelf (640 mm) can accommodate a mouse as well
- Depth of keyboard shelf 172 mm
- Includes two cable clips for guiding and bundling cables
- Maximum load 10 kg
- Dimensions (HxWxD) 360 x 640 x 276 mm

Dust cover for three-level experiment trolleys

- For protecting equipment from dust and damp
- For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque)
- Colour: matt dark grey with printed LN logo in orange)
- Material: nylon fabric with polyurethane coating
- High resistant to tearing, impregnated to be washable and waterproof



Recommended learning management software for all LN multimedia courses:

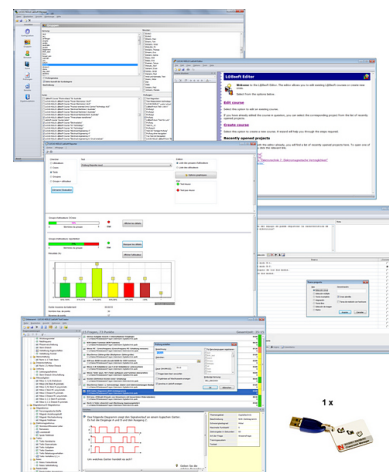


Optionally available: multi user license with 5 or 10 dongles and update to version 4.0

Pos.	Product name	Bestell-Nr.	Anz.
23	LabSoft Classroom Manager 4.0 software suite, single license	SO2001-5A	1

LabSoft Classroom Manager is a comprehensive set of administration software for the UniTrain system and all LabSoft courses. Classroom Manager comprises the following independent program components:

- LabSoft Manager: Administration of students and courses in LabSoft
- LabSoft Reporter: Student reports and statistics
- LabSoft Editor: Creation and editing of courses and tests
- LabSoft Questioner: Creation of questions, measuring exercises and sets of questions for courses and tests
- LabSoft TestCreator: Automatic generation of tests on the basis of sets of questions



Features:

- Ease of use of all programs thanks to graphical user interface in all component programs
- For use in local area networks or on stand-alone PC
- Ease of installation
- No additional database software required
- Access control via USB dongle
- Available languages: DE, EN, ES, FR, RU, PT, ZH, LO

LabSoft Manager:

- Administration of LabSoft network installation
- Administration of an unlimited number of students and courses in LabSoft
- Addition, deletion and editing of courses and tests in LabSoft
- Addition, deletion and editing of students and student data
- Addition, deletion and editing of student groups (classes)
- Assignment of students to classes
- Assignment of courses and tests to students or classes

LabSoft Reporter:

- Electronic monitoring of student progress
- Graphical presentation of progress in courses and tests
- Presentation of student or group results
- Reports on courses, tests, single users or classes
- Summary of results and time
- Calculation of average results for groups
- Multiple search options for students, classes, courses or tests

LabSoft Editor:

- HTML editor for easy to use editing of LabSoft courses
- Editing of course pages
- Wizard for creation of new courses and course pages

- Automatic inclusion of new courses in an existing LabSoft installation
- Automatic creation of IMS-compatible navigation tree without the need for programming knowledge
- Moving course pages within the navigation tree at the click of a mouse
- Editing in WYSIWYG mode
- HTML view and page preview
- Insertion of graphics, animations and tables
- Insertion of test questions
- Page templates for a variety of page types

LabSoft Questioner:

- Program for creating and editing questions, practical measuring exercises and sets of questions (question files) for electronic evaluation
- Easy creation of exercises and questions for courses and tests
- 7 different types of question: single and multiple choice, missing text, assignment, matrices, arbitrary text, selection of images
- Ability to input meta data (points, time for questions, difficulty, required resources, etc.)
- Easy specification of tolerances for practical measuring exercises

LabSoft TestCreator:

- Program for automatically creating electronic tests from sets of questions (question files)
- Automatic and manual selection of questions and measuring exercises
- Filter functions (e.g.: type of question, difficulty) for pre-selection of questions
- Automatic generation of tests according to a set time or number of questions
- Various test options: arbitrary order of questions in a test, immediate display of results after completion
- Automatic registration of tests in LabSoft
- Preview function showing the test as created

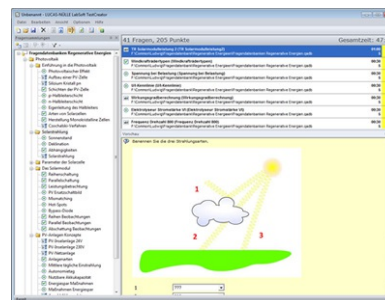
Includes:

- CD-ROM with LabSoft Classroom Manager
- 1 USB-dongle for operation of program

System requirements:

- Server or PC with Windows Vista, 7, 8 or 8.1
- Microsoft Internet Explorer 7.0 or higher
- Minimum 100 MB free disk space
- 1 free USB-port for USB-dongle

Collection of electronic assignments questions and measuring exercises for the UniTrain courses on the topic of electrical power engineering and renewable energies. With the help of Labsoft TestCreator, these questions and measuring exercises can easily be assembled into electronic tests. The tests can then be carried out in LabSoft.



- A total of some 200 questions and measuring exercises for the UniTrain courses on the topics of Photovoltaics, Fuel cell technology, Transient processes in AC and DC networks and the multimedia course Small wind power plant
- About 25% are practical exercises to be carried using the training systems in order to test handling skills and practical abilities
- About 30% are newly assembled questions previously contained in the courses
- It is possible to extend the collection with your own questions and assignments
- Other collections can be imported
- All questions and assignments can be edited
- 6 different types of questions (single choice, multiple choice, missing text, matching, matrix matching and image choice)
- Extensive metadata for all questions and assignments to make it easier to create tests (degree of difficulty, points, topic area, time to complete, type of question, training systems needed for practical exercises)

EPH 3.2 Configuration of photovoltaic systems to operate in parallel with the power grid

EPH 3.2 Configuration of photovoltaic systems to operate in parallel with the power grid

Training contents:

- Installation of photovoltaic systems
- Set-up and testing of a photovoltaic system with feed to the power grid
- Measurement of energy generated by photovoltaic systems
- Maximum Power Point (MPP) Tracking
- Limiting the power of the photovoltaic inverter (derating)
- Provision of reactive power
- Determining the efficiency of the power grid inverter
- Response to control of the power grid inverter
- Recording output data using sun passage emulator
- Investigating the response of a photovoltaic system when there is a power outage on the grid
- Lightning protecting for photovoltaic systems
- Economic benefits of photovoltaic systems

Basic equipment set, consisting of:

Basic equipment set, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
25	Solar panel emulator, 1.5 kW, 500 V	CO3208-1P	1

The solar panel emulator is a configurable emulator of a solar panel which allows for realistic emulation of response.

The solar module emulator has the following features:

Solar panel software:

- The solar panel can be configured using the supplied software
- Implementation of configurable partial shading of the solar panel
- Light intensity can be adjusted from 0% ... 100%
- It is possible to configure light intensity curves which change over time
- The current operating point is graphically represented at its position on photovoltaic characteristic
- Measurement and display of electrical variables

Technical data:

- The system is protected against short circuits
- Open-circuit voltage: 500 V
- Closed-circuit current: 10 A
- Power output: 1500 W
- Operating voltage: 100-240V, 45-65Hz
- Dimensions: 100 x 450 x 600 mm (HxWxD)
- Weight: 11.8 kg



26	3-phase industrial photovoltaic inverter	CO3208-1N	1
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Modern solar installations feed electric power into the main power grid with the help of a power converter.

The power inverter has the following features:

- Photovoltaic inverter consisting of an actual inverter, a monitoring unit and a DC circuit breaker
- Feed management conforming to EEG2012 via separate communications interface
- Power reduction adjustable from 0 to 100% in 1% steps
- Adjustable power factor from 0.8 capacitive to 0.8 inductive
- Integrated web server user interface
- USB port for remote operation via SCADA Power Lab
- Integrated DC circuit breaker
- Overload voltage protection for photovoltaic and bus terminals
- DC input voltage range: 250-1000V
- Output voltage: 3x400 V/50 Hz
- Power output: 3200 W
- Terminals take the form of 4-mm safety sockets
- Dimensions: 650 x 456 x 305 mm (HxWxD)
- Weight: 15 kg



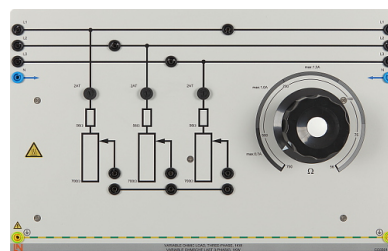
27 **Variable Ohmic load, three-phase, 1kW**

CO3301-3F

1

Three synchronously adjustable circular rheostats with scale 100 - 0%, each with a fuse in the sliding-contact connection.

- for parallel, series, star and delta circuits
- Resistance: 3 x 750 Ohm
- Current: 3 x 2 A
- Inputs/outputs: 4mm safety sockets
- Dimensions: 297 x 456 x 125mm (HxWxD)
- Weight: 8kg

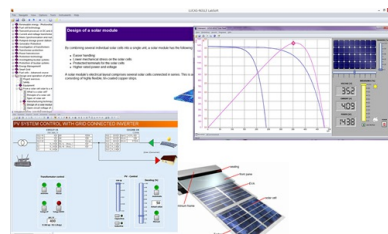


Media:



Pos.	Product name	Bestell-Nr.	Anz.
28	Interactive Lab Assistant: Professional Photovoltaic Systems	SO2800-3G	1

The experiment instructions come in the form of an Interactive Lab Assistant course. This multimedia course is a step-by-step guide through the topic of modern photovoltaic energy systems. The physical fundamentals are conveyed using easy to understand animations. The Interactive Lab Assistant in conjunction with the virtual instruments constitutes a comfortable experimenting environment.



Special features:

- Interactive experiment setups
- Measured values and diagrams can be stored in the experiment instructions per drag and drop
- Virtual instruments can be started directly from the experiment instructions
- Includes questions with feedback and evaluation logic for progress monitoring
- Documents can be printed out for hardcopy of experiment instructions including solutions
- CD-ROM with Labsoft browser, course software and virtual instruments
- Course duration 14 h approx.

Software:

Pos.	Product name	Bestell-Nr.	Anz.
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29	Software SCADA Viewer	SO4001-3H	1
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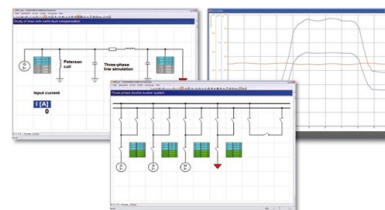
The 'SCADA Viewer' is a software program used for the control and monitoring of power engineering systems. With the software it is possible to display all measured values and operating states inside the system in real time on the existing measuring instruments. Important parameters and signals can be controlled by the software.

The measured values and operating states of the equipment can be selected, recorded and plotted over time, evaluated and then exported.

Using the 'SCADA Viewer' projects in power engineering are not only made transparent but readable.

Software functions:

- Display of measured values and operating states in real time
- Plotting of measured values over time in diagrams
- Processing, analyzing and exporting of diagrams
- The SCADA viewer contains more than 20 predefined projects
- Many projects designed with the SCADA designer can be individually expanded at will



30	Patch cable Cat5E 1x 1m yellow, 2x 2m yellow	LM9057	1
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- 1x 1m yellow
- 2x 2m yellow



31 USB Network Adapter 10/100 BaseTX RJ45

LM9056

1

USB-Ethernet adapter provides simple network access without having to install expansion card. The adapter is thus well-suited especially for cases where there are no more slots available in the PC or the housing should not be opened. This adapter is also an alternative for notebooks: instead of a PC card with an Ethernet port the adapter offers a universal connection option for all PCs with USB interface.



- USB 2.0 high-speed device
- Downward compatible with USB 1.1 and 1.0 Host controllers
- Compatible with IEEE 802.3u, 10/100 Base-T and TX
- Supports both full and half-duplex mode on Ethernet interface
- Operating systems: Windows ME/200/XP/Vista,7 (32+64 Bit), Linux, Mac OS 10.x

32 5-Port Ethernet Switch

LM9988

1

- 5-Port Ethernet Switch
- 5 RJ45 terminals
- Power supply



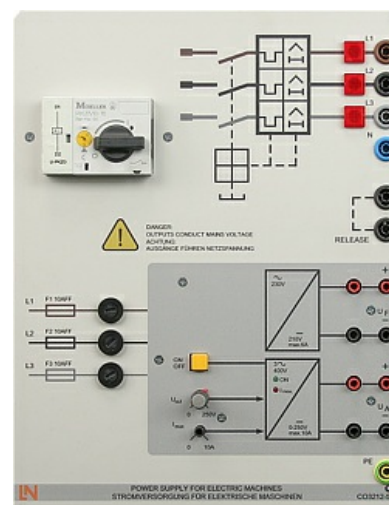
Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
------	--------------	-------------	------

33	Universal power supply for electrical machines	CO3212-5U	1
----	---	-----------	---

Power supply for DC, AC and three-phase current and for excitation of synchronous machines. The supply is specially designed for use with electrical machines.

- Outputs:
Three phase: L1, L2, L3, N from 4-mm safety sockets
DC: 0...240VDC variable, controlled and electronically protected against overload and short circuits.
Output current: 3...10A (adjustable current limiting)
- Second DC supply ca. 210VDC, 6A fixed
- Protective systems:
Motor protection switch adjustable from 6.3...16A
Undervoltage trip
Safety cut-out
- Power connection: 3x 230/400V, 50/60Hz via CEE plug with 1.8m power lead
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 3kg



34	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1
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Multiple socket outlet, 6 fold, with illuminated switch, 2 pole

- 6 earth pin sockets according to DIN49440, 250V~, 16A
- power cord 1,5m
- Dimensions: 439 x 60 x 44mm (LxWxH)



Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
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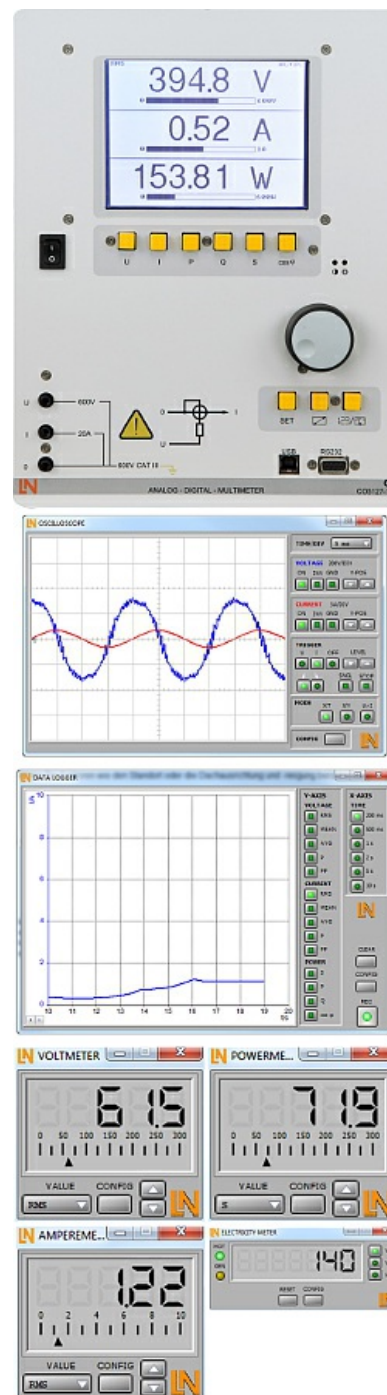
35	Digital/analog multimeter, wattmeter, power-factor incl. software	CO5127-1Z	1
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The areas of electrical machines, power electronics and drive technology pose particular problems for measuring instruments. In addition to high-performance overload protection, the acquisition of measurement values must be performed accurately independently of the curve's shape. The universal measuring device has been designed particularly to satisfy these requirements. It can simultaneously replace as many as four different measuring instruments – constituting a current/voltmeter, power and phase-angle meter all in one. The graphic display allows for both student as well demonstration experiments. The VI Starter software included allows for visualisation of measurements on a PC.

- Simultaneous, measurement of voltage and current independent of the curve shape (max. 600 V, 20 A) (measurement of clocked voltages)
- Calculation of active, apparent and reactive power as well as the power factor
- Measurement of the total rms (RMS-AC+DC), AC rms (RMS-AC) and arithmetic mean (AV-AC+DC)
- Impervious to electrical damage up to 20 A/600 V
- Large-scale, high-contrast background-illuminated graphic display (5.7")
- Large-scale display or display of up to 4 measurement values
- Digital or pseudo-analog display
- USB interface
- Internal resistance: current path 10 mΩ, voltage path 10 MΩ
- Voltage ranges: 30, 300, 600 V
- Current ranges: 1, 10, 20 A
- Measurement accuracy: 2%
- Automatic or manual measurement range selection
- Demonstration test instrument for measuring properties of the electricity supply
- Operating voltage: 230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxBxT)
- Weight: 2kg

The VI Starter software allows all the measurements to be displayed on the PC. Up to 17 different displays can be opened.

- Oscilloscope display of voltage, current and power
- Consumption meter to display power consumed and output
- Data logger for 14 different variables
- Data export for data logger
- Characteristic recorder
- Labview driver and supplied examples
- 32-bit version for Windows



The three-phase measuring instrument permits the measurement and display of relevant power network parameters. It is able to measure single, two-phase or three-phase measurements. The display and operation is carried out by means of menu navigation with an LC display or the integrated Ethernet interface. The optional SCADA software provides for the display of all measurements and allows the implementation and analysis of intelligent networks (smart grids). The “smart meter” acts as a digital electricity meter where end customers are connected to the grid in order to measure electricity consumption and can be used to turn consumers on or off depending on the circumstances.

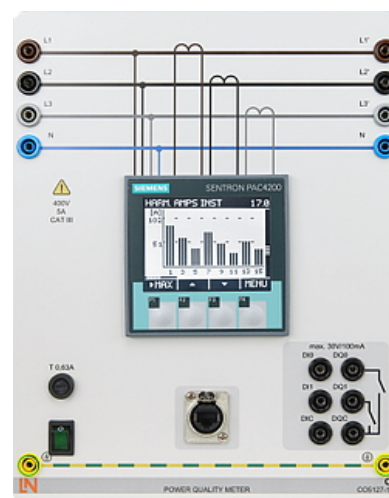
- Three-phase measurement of current and voltage 3x400V/5A
- Measurement of phase voltages, line-to-line voltages and currents
- Determination of the apparent, active and reactive power
- Determination of active, reactive and apparent work
- Determination of the frequency and distortion factors for current and voltage
- Detection of harmonic oscillations and neutral conductor current in the electricity supply
- Pulse measurement
- Peak and mean value detection
- Event logging
- Real-time clock
- Large-scale, contrast-rich graphic display with background illumination
- Display in tables, diagrams and vector diagrams
- 2 Digital inputs and outputs for free configuration including functions
- Ethernet interface
- Menu navigation in German/English/
French/Spanish/Italian/Portuguese/Turkish/
Chinese/Russian/Polish
- Demonstration measuring instrument for making measurements on the electricity supply grid

Max. measurement values:




- Voltage P-P: 690 V
- Current: 5 A

Fault tolerances:

- Voltage 0.2%
- Current 0.2%
- Apparent power 0.5%
- Active power 0.2%
- Reactive power 1%
- Active energy Class 0.2
- Reactive energy Class 2
- Operating voltage: 110V-230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 2kg



Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
37	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	SO5126-3R	20
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour black 		
38	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	SO5126-3V	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour blue 		
39	Safety connecting plug 4mm with tap (2x), green/yellow, 1000V/32A CAT II	SO5126-3W	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour green/yellow 		

40 **Set of safety measurement cables, 4mm (31 leads)**

SO5148-1L

1



Safety measurement cables with 4mm safety plugs, coloured, PVC insulation, highly flexible

Each set includes the following:

- 6 x 25cm long, black
- 4 x 50cm long, black
- 2 x 100cm long, blue
- 2 x 100cm long, red
- 1 x 100cm long, green/yellow
- 1 x 150cm long, blue
- 1 x 150cm long, green/yellow
- 2 x 150cm long, green
- 4 x 150cm long, brown
- 4 x 150cm long, black
- 4 x 150cm long, grey

- Wire cross section 2.5 mm²
- Capacity/category: 600V CAT II, 32A

41 **Mobile aluminium experiment stand, 3 levels, power strip with 6 sockets, 1250x700x1995mm**

ST7200-3A

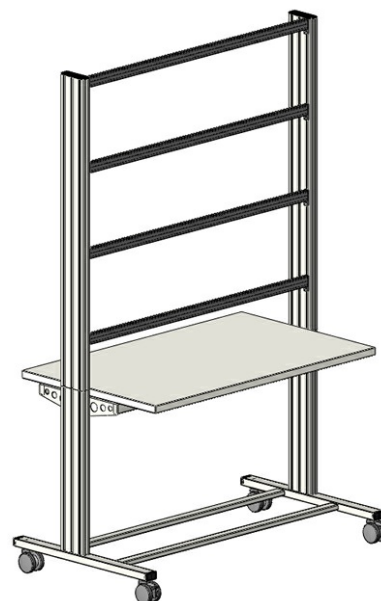
1

High-quality, mobile experiments stand from the SybaPro range for demonstrations and experiments. Features aluminium profile legs compatible with all add-ons and extensions for the SybaPro system.

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.

Table top:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Table top with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug



Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
- 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
- Space for extension of power supply duct
- Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
- Table frame made of tough combination of rectangular tubing around the full perimeter
- Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1995 x 700 mm (WxHxD)

42 Protected power distribution for working stations

ST8008-8M

1

400-V CEE distribution panel with automatic circuit breakers for attachment to profiles on experiment trolleys or direct to table-top.



- 2 CEE sockets (400 V, 16 A, 5-pole) with safety flap
- 1 Socket outlet with earth (230 V) plus safety flap
- Circuit breaker: 1 x 3-pole line circuit breaker, type B, 16 A
- Power connection: 3 x 230/400 V, 50/60 Hz via CEE plug, 4-m power lead
- Dimensions: 530 x 130 x 110 mm (HxWxD)
- Weight: 3 kg

43 Wall or aluminium-profile mounting cable storage for 48 cables

ST8003-8E

1

Accommodates about 48 safety measuring leads (4mm), suitable for mounting on walls or aluminium profiles



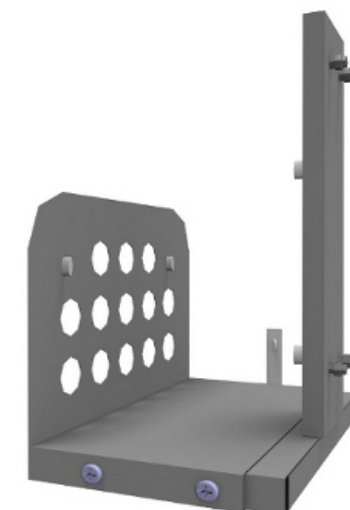
- Width 200 mm, 12 guide grooves for leads
- Adjustable height for mounting on aluminium profiles
- Can be mounted on the left or right
- Can be mounted on walls
- Includes 2 screws and tenon blocks
- Acid-resistant epoxy-resin powder coating, thickness 80 µm approx., colour RAL 7047

44 PC holder for SybaPro experiment trolleys, height/width adjustable

ST7200-5A

1

Shelf for desktop PC made of 1.5mm sheet steel punched with holes, suitable for all furniture in the SybaPro aluminium profile range



- Adjustable assembly height
- Adjustable width (160 - 255mm)
- Can be mounted to left or right
- Includes all equipment necessary for assembly (4 bolts and 4 tenon blocks)
- Acid-resistant epoxy-resin powder coating, 80µm thick approx., colour RAL7047

45 **Monitor holder for flat screen monitor of weight up to 15kg / 33lbs**

ST8010-4T

1

Pivoting monitor holder for attachment to aluminium profiles of furniture in the SybaPro range. Allows a monitor to be placed in the optimum position so that work and experiments are less tiring.



- Pivoting arm with two-part joint
- Quick-lock for adjustment to any height on extruded aluminium profile
- VESA fastening 7.5 x 7.5cm
- Includes VESA 75 (7.5x7.5) - VESA 100 (10x10) adapter
- 2 Cable clips
- Adequate carrying capacity 15kg / 33lbs
- TFT monitor can be turned parallel to the table edge
- Separation can be adjusted to anywhere between 105 and 480mm

Additionally included:

Cable management set for installing cables along the profiles of the aluminium lab system furniture in the SybaPro range, consisting of:

- 3 Cross cable binders for front and rear grooves of aluminium profile
- 3 Cross cable binders for side grooves of aluminium profile
- 12 Cable binders
- 4 Aluminium cover profiles for covering and enabling wires to be run along the grooves of an aluminium profile

46 **Keyboard adapter for flat screen monitor holders**

ST8010-4G

1

Keyboard adapter for use in combination with flat screen monitor holders



- Mounted between monitor and mount for flat screen monitor holder
- Variable 3-level height adjustment via multiple pre-drilled mounting holes
- Two rows of mounting holes for use with equipment meeting VESA 75 and VESA 100 standards
- Keyboard shelf inclined by about 30° for comfortable and ergonomic usability
- Keyboard shelf with 11-mm folded edging to prevent falling, including handle
- Variable 2-level depth attachment for keyboard shelf (252/276 mm)
- Extra-wide keyboard shelf (640 mm) can accommodate a mouse as well
- Depth of keyboard shelf 172 mm
- Includes two cable clips for guiding and bundling cables
- Maximum load 10 kg
- Dimensions (HxWxD) 360 x 640 x 276 mm

47 **Protection cover for three-level experiment trolleys**

ST8010-9Y

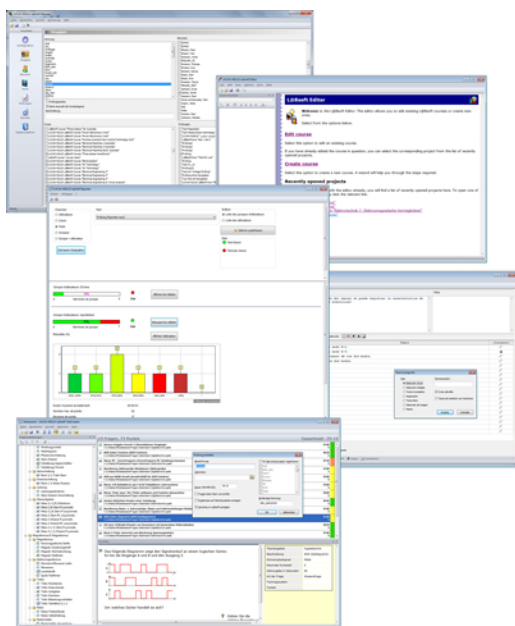
1

Dust cover for three-level experiment trolleys

- For protecting equipment from dust and damp
- For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque)
- Colour: matt dark grey with printed LN logo in orange)
- Material: nylon fabric with polyurethane coating
- High resistant to tearing, impregnated to be washable and waterproof



Recommended learning management software for all LN multimedia courses:

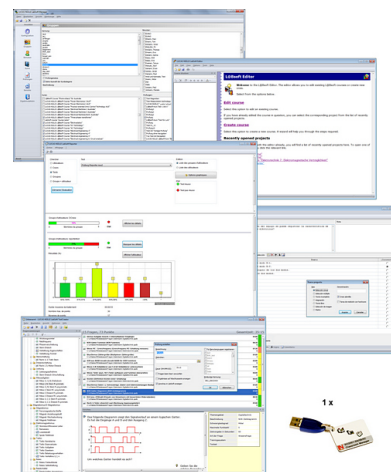


Optionally available: multi user license with 5 or 10 dongles and update to version 4.0

Pos.	Product name	Bestell-Nr.	Anz.
48	LabSoft Classroom Manager 4.0 software suite, single license	SO2001-5A	1

LabSoft Classroom Manager is a comprehensive set of administration software for the UniTrain system and all LabSoft courses. Classroom Manager comprises the following independent program components:

- LabSoft Manager: Administration of students and courses in LabSoft
- LabSoft Reporter: Student reports and statistics
- LabSoft Editor: Creation and editing of courses and tests
- LabSoft Questioner: Creation of questions, measuring exercises and sets of questions for courses and tests
- LabSoft TestCreator: Automatic generation of tests on the basis of sets of questions



Features:

- Ease of use of all programs thanks to graphical user interface in all component programs
- For use in local area networks or on stand-alone PC
- Ease of installation
- No additional database software required
- Access control via USB dongle
- Available languages: DE, EN, ES, FR, RU, PT, ZH, LO

LabSoft Manager:

- Administration of LabSoft network installation
- Administration of an unlimited number of students and courses in LabSoft
- Addition, deletion and editing of courses and tests in LabSoft
- Addition, deletion and editing of students and student data
- Addition, deletion and editing of student groups (classes)
- Assignment of students to classes
- Assignment of courses and tests to students or classes

LabSoft Reporter:

- Electronic monitoring of student progress
- Graphical presentation of progress in courses and tests
- Presentation of student or group results
- Reports on courses, tests, single users or classes
- Summary of results and time
- Calculation of average results for groups
- Multiple search options for students, classes, courses or tests

LabSoft Editor:

- HTML editor for easy to use editing of LabSoft courses
- Editing of course pages
- Wizard for creation of new courses and course pages

- Automatic inclusion of new courses in an existing LabSoft installation
- Automatic creation of IMS-compatible navigation tree without the need for programming knowledge
- Moving course pages within the navigation tree at the click of a mouse
- Editing in WYSIWYG mode
- HTML view and page preview
- Insertion of graphics, animations and tables
- Insertion of test questions
- Page templates for a variety of page types

LabSoft Questioner:

- Program for creating and editing questions, practical measuring exercises and sets of questions (question files) for electronic evaluation
- Easy creation of exercises and questions for courses and tests
- 7 different types of question: single and multiple choice, missing text, assignment, matrices, arbitrary text, selection of images
- Ability to input meta data (points, time for questions, difficulty, required resources, etc.)
- Easy specification of tolerances for practical measuring exercises

LabSoft TestCreator:

- Program for automatically creating electronic tests from sets of questions (question files)
- Automatic and manual selection of questions and measuring exercises
- Filter functions (e.g.: type of question, difficulty) for pre-selection of questions
- Automatic generation of tests according to a set time or number of questions
- Various test options: arbitrary order of questions in a test, immediate display of results after completion
- Automatic registration of tests in LabSoft
- Preview function showing the test as created

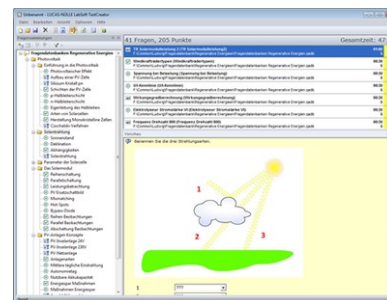
Includes:

- CD-ROM with LabSoft Classroom Manager
- 1 USB-dongle for operation of program

System requirements:

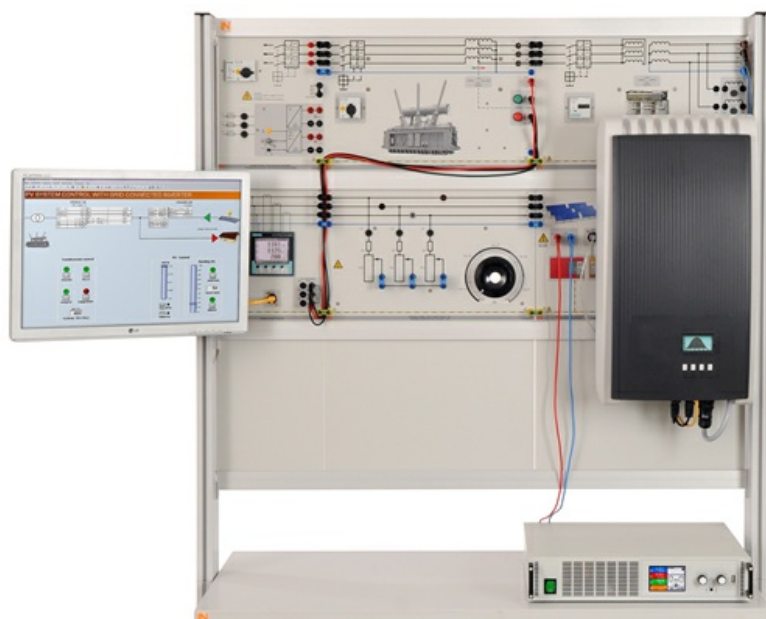
- Server or PC with Windows Vista, 7, 8 or 8.1
- Microsoft Internet Explorer 7.0 or higher
- Minimum 100 MB free disk space
- 1 free USB-port for USB-dongle

Collection of electronic assignments questions and measuring exercises for the UniTrain courses on the topic of electrical power engineering and renewable energies. With the help of Labsoft TestCreator, these questions and measuring exercises can easily be assembled into electronic tests. The tests can then be carried out in LabSoft.



- A total of some 200 questions and measuring exercises for the UniTrain courses on the topics of Photovoltaics, Fuel cell technology, Transient processes in AC and DC networks and the multimedia course Small wind power plant
- About 25% are practical exercises to be carried using the training systems in order to test handling skills and practical abilities
- About 30% are newly assembled questions previously contained in the courses
- It is possible to extend the collection with your own questions and assignments
- Other collections can be imported
- All questions and assignments can be edited
- 6 different types of questions (single choice, multiple choice, missing text, matching, matrix matching and image choice)
- Extensive metadata for all questions and assignments to make it easier to create tests (degree of difficulty, points, topic area, time to complete, type of question, training systems needed for practical exercises)

EPH 3.3 Voltage control in a local power grid



EPH 3.3 Voltage control in a local power grid

Training contents:

- Local-area network transformer
- Limiting the power of the photovoltaic inverter (derating)
- Automatic voltage control in a local power grid
- Operation and monitoring using SCADA

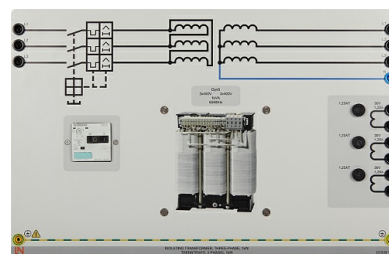
Supplement to basic set EPH 3.2, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
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50	Isolating transformer, Three-phase, 1kW	CO3301-3N	1
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Transformer for feeding the transmission line model. Scale factor 1:1000 for secondary current and voltage.

- Input voltages: 3 x 400V
- Output voltage 1: 3 x 400V, 2 A
- Output voltage 2: 3 x 30V, 1.25A
- Power rating: 1000 VA, for a short time: 2000VA
- Vector group: Dyn5
- Protection: 1 automatic circuit breaker 1.8-2.5A, adjustable
- Inputs/Outputs: 4mm safety sockets
- Dimensions: 297 x 456 x 150 mm
- Weight: 11kg

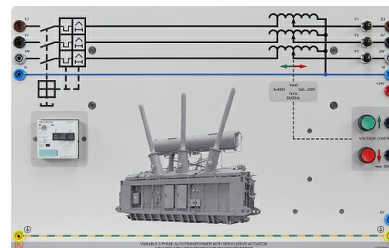


51 Three-phase variable transformer with motor drive

CO3301-3P

1

The purpose of this controllable transformer is to compensate for the fluctuations in voltage output from power transformers which arise from changes in load. It achieves this by modifying the transformation ratio on the side where the voltage is in excess. The component can be used as a step-up or step-down transformer. Control is handled via the inputs for increasing or decrease the voltage, e.g. with the help of the power quality meter (CO5127-1S).



- Primary: 3x up to 400 V windings
- Secondary: 3x 0 ... 450 V, 2 A windings
- Nominal power: 1000 VA
- Frequency: 50/60 HZ
- Vector group: Yan0
- 24 V input/"Increase voltage" button
- 24 V input/"Decrease voltage" button
- Protection: 1 automatic circuit breaker, (adjustable)
- Inputs/outputs: 4-mm safety sockets
- Dimensions: 297 x 456 x 150 mm
- Weight: 10 kg

Media:



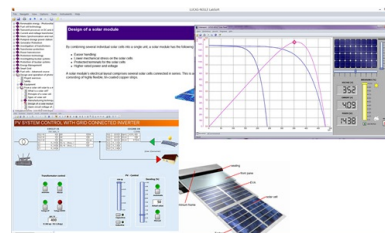
Pos.	Product name	Bestell-Nr.	Anz.
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52 **Interactive Lab Assistant: Professional Photovoltaic Systems**

SO2800-3G

1

The experiment instructions come in the form of an Interactive Lab Assistant course. This multimedia course is a step-by-step guide through the topic of modern photovoltaic energy systems. The physical fundamentals are conveyed using easy to understand animations. The Interactive Lab Assistant in conjunction with the virtual instruments constitutes a comfortable experimenting environment.



Special features:

- Interactive experiment setups
- Measured values and diagrams can be stored in the experiment instructions per drag and drop
- Virtual instruments can be started directly from the experiment instructions
- Includes questions with feedback and evaluation logic for progress monitoring
- Documents can be printed out for hardcopy of experiment instructions including solutions
- CD-ROM with Labsoft browser, course software and virtual instruments
- Course duration 14 h approx.

Software:

Pos.	Product name	Bestell-Nr.	Anz.
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53	Software SCADA Viewer	SO4001-3H	1
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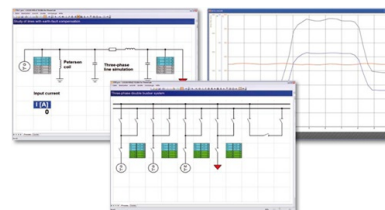
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The measured values and operating states of the equipment can be selected, recorded and plotted over time, evaluated and then exported.

Using the 'SCADA Viewer' projects in power engineering are not only made transparent but readable.

Software functions:

- Display of measured values and operating states in real time
- Plotting of measured values over time in diagrams
- Processing, analyzing and exporting of diagrams
- The SCADA viewer contains more than 20 predefined projects
- Many projects designed with the SCADA designer can be individually expanded at will



54	Patch cable Cat5E 1x 1m yellow, 2x 2m yellow	LM9057	1
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- 1x 1m yellow
- 2x 2m yellow



55 USB Network Adapter 10/100 BaseTX RJ45

LM9056

1

USB-Ethernet adapter provides simple network access without having to install expansion card. The adapter is thus well-suited especially for cases where there are no more slots available in the PC or the housing should not be opened. This adapter is also an alternative for notebooks: instead of a PC card with an Ethernet port the adapter offers a universal connection option for all PCs with USB interface.



- USB 2.0 high-speed device
- Downward compatible with USB 1.1 and 1.0 Host controllers
- Compatible with IEEE 802.3u, 10/100 Base-T and TX
- Supports both full and half-duplex mode on Ethernet interface
- Operating systems: Windows ME/200/XP/Vista,7 (32+64 Bit), Linux, Mac OS 10.x

56 5-Port Ethernet Switch

LM9988

1

- 5-Port Ethernet Switch
- 5 RJ45 terminals
- Power supply



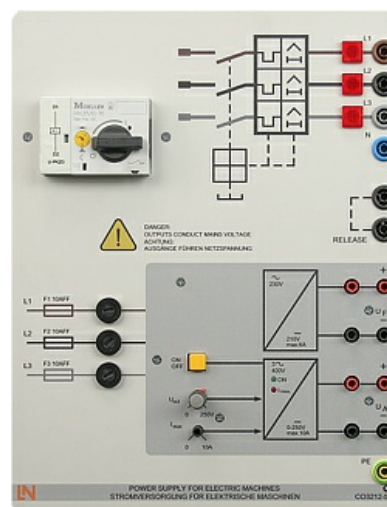
Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
------	--------------	-------------	------

57	Universal power supply for electrical machines	CO3212-5U	1
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Power supply for DC, AC and three-phase current and for excitation of synchronous machines. The supply is specially designed for use with electrical machines.

- Outputs:
Three phase: L1, L2, L3, N from 4-mm safety sockets
DC: 0...240VDC variable, controlled and electronically protected against overload and short circuits.
Output current: 3...10A (adjustable current limiting)
- Second DC supply ca. 210VDC, 6A fixed
- Protective systems:
Motor protection switch adjustable from 6.3...16A
Undervoltage trip
Safety cut-out
- Power connection: 3x 230/400V, 50/60Hz via CEE plug with 1.8m power lead
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 3kg



58	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1
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Multiple socket outlet, 6 fold, with illuminated switch, 2 pole

- 6 earth pin sockets according to DIN49440, 250V~, 16A
- power cord 1,5m
- Dimensions: 439 x 60 x 44mm (LxWxH)



Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
------	--------------	-------------	------

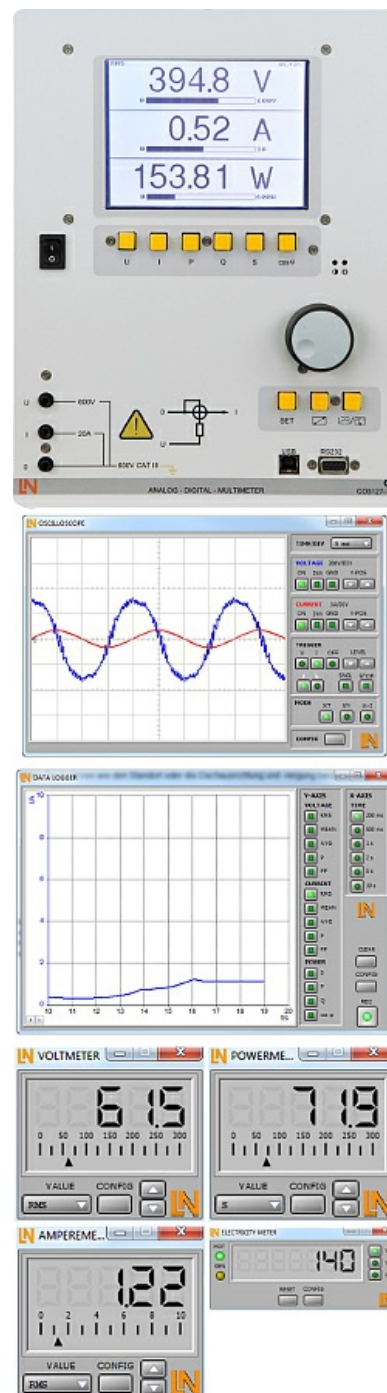
59	Digital/analog multimeter, wattmeter, power-factor incl. software	CO5127-1Z	1
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The areas of electrical machines, power electronics and drive technology pose particular problems for measuring instruments. In addition to high-performance overload protection, the acquisition of measurement values must be performed accurately independently of the curve's shape. The universal measuring device has been designed particularly to satisfy these requirements. It can simultaneously replace as many as four different measuring instruments – constituting a current/voltmeter, power and phase-angle meter all in one. The graphic display allows for both student as well demonstration experiments. The VI Starter software included allows for visualisation of measurements on a PC.

- Simultaneous, measurement of voltage and current independent of the curve shape (max. 600 V, 20 A) (measurement of clocked voltages)
- Calculation of active, apparent and reactive power as well as the power factor
- Measurement of the total rms (RMS-AC+DC), AC rms (RMS-AC) and arithmetic mean (AV-AC+DC)
- Impervious to electrical damage up to 20 A/600 V
- Large-scale, high-contrast background-illuminated graphic display (5.7")
- Large-scale display or display of up to 4 measurement values
- Digital or pseudo-analog display
- USB interface
- Internal resistance: current path 10 mΩ, voltage path 10 MΩ
- Voltage ranges: 30, 300, 600 V
- Current ranges: 1, 10, 20 A
- Measurement accuracy: 2%
- Automatic or manual measurement range selection
- Demonstration test instrument for measuring properties of the electricity supply
- Operating voltage: 230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxBxT)
- Weight: 2kg

The VI Starter software allows all the measurements to be displayed on the PC. Up to 17 different displays can be opened.

- Oscilloscope display of voltage, current and power
- Consumption meter to display power consumed and output
- Data logger for 14 different variables
- Data export for data logger
- Characteristic recorder
- Labview driver and supplied examples
- 32-bit version for Windows



The three-phase measuring instrument permits the measurement and display of relevant power network parameters. It is able to measure single, two-phase or three-phase measurements. The display and operation is carried out by means of menu navigation with an LC display or the integrated Ethernet interface. The optional SCADA software provides for the display of all measurements and allows the implementation and analysis of intelligent networks (smart grids). The “smart meter” acts as a digital electricity meter where end customers are connected to the grid in order to measure electricity consumption and can be used to turn consumers on or off depending on the circumstances.

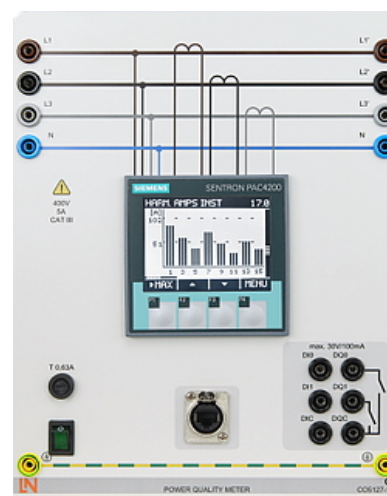
- Three-phase measurement of current and voltage 3x400V/5A
- Measurement of phase voltages, line-to-line voltages and currents
- Determination of the apparent, active and reactive power
- Determination of active, reactive and apparent work
- Determination of the frequency and distortion factors for current and voltage
- Detection of harmonic oscillations and neutral conductor current in the electricity supply
- Pulse measurement
- Peak and mean value detection
- Event logging
- Real-time clock
- Large-scale, contrast-rich graphic display with background illumination
- Display in tables, diagrams and vector diagrams
- 2 Digital inputs and outputs for free configuration including functions
- Ethernet interface
- Menu navigation in German/English/
French/Spanish/Italian/Portuguese/Turkish/
Chinese/Russian/Polish
- Demonstration measuring instrument for making measurements on the electricity supply grid

Max. measurement values:




- Voltage P-P: 690 V
- Current: 5 A

Fault tolerances:

- Voltage 0.2%
- Current 0.2%
- Apparent power 0.5%
- Active power 0.2%
- Reactive power 1%
- Active energy Class 0.2
- Reactive energy Class 2
- Operating voltage: 110V-230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 2kg



Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
61	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	SO5126-3R	20
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour black 		
62	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	SO5126-3V	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour blue 		
63	Safety connecting plug 4mm with tap (2x), green/yellow, 1000V/32A CAT II	SO5126-3W	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour green/yellow 		

64 **Set of safety measurement cables, 4mm (31 leads)**

SO5148-1L

1

Safety measurement cables with 4mm safety plugs, coloured,
PVC insulation, highly flexible



Each set includes the following:

- 6 x 25cm long, black
- 4 x 50cm long, black
- 2 x 100cm long, blue
- 2 x 100cm long, red
- 1 x 100cm long, green/yellow
- 1 x 150cm long, blue
- 1 x 150cm long, green/yellow
- 2 x 150cm long, green
- 4 x 150cm long, brown
- 4 x 150cm long, black
- 4 x 150cm long, grey

- Wire cross section 2.5 mm²
- Capacity/category: 600V CAT II, 32A

65 **Mobile aluminium experiment stand, 3 levels, power strip with 6 sockets, 1250x700x1995mm**

ST7200-3A

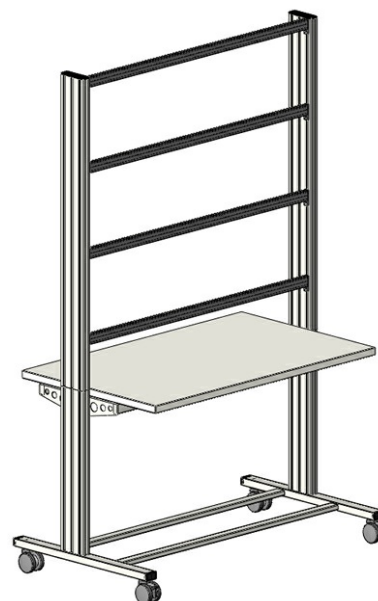
1

High-quality, mobile experiments stand from the SybaPro range for demonstrations and experiments. Features aluminium profile legs compatible with all add-ons and extensions for the SybaPro system.

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.

Table top:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Table top with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug



Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
- 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
- Space for extension of power supply duct
- Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
- Table frame made of tough combination of rectangular tubing around the full perimeter
- Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1995 x 700 mm (WxHxD)

66 Protected power distribution for working stations

ST8008-8M

1

400-V CEE distribution panel with automatic circuit breakers for attachment to profiles on experiment trolleys or direct to table-top.

- 2 CEE sockets (400 V, 16 A, 5-pole) with safety flap
- 1 Socket outlet with earth (230 V) plus safety flap
- Circuit breaker: 1 x 3-pole line circuit breaker, type B, 16 A
- Power connection: 3 x 230/400 V, 50/60 Hz via CEE plug, 4-m power lead
- Dimensions: 530 x 130 x 110 mm (HxWxD)
- Weight: 3 kg



67 Wall or aluminium-profile mounting cable storage for 48 cables

ST8003-8E

1

Accommodates about 48 safety measuring leads (4mm), suitable for mounting on walls or aluminium profiles

- Width 200 mm, 12 guide grooves for leads
- Adjustable height for mounting on aluminium profiles
- Can be mounted on the left or right
- Can be mounted on walls
- Includes 2 screws and tenon blocks
- Acid-resistant epoxy-resin powder coating, thickness 80 µm approx., colour RAL 7047



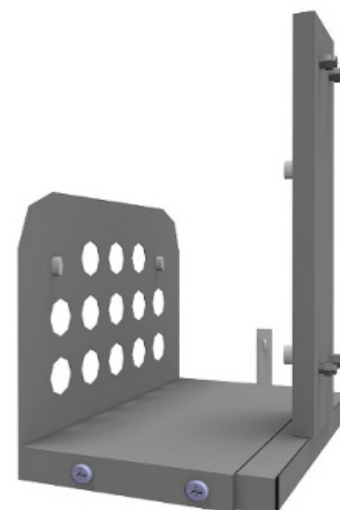
68 PC holder for SybaPro experiment trolleys, height/width adjustable

ST7200-5A

1

Shelf for desktop PC made of 1.5mm sheet steel punched with holes, suitable for all furniture in the SybaPro aluminium profile range

- Adjustable assembly height
- Adjustable width (160 - 255mm)
- Can be mounted to left or right
- Includes all equipment necessary for assembly (4 bolts and 4 tenon blocks)
- Acid-resistant epoxy-resin powder coating, 80µm thick approx., colour RAL7047



69 **Monitor holder for flat screen monitor of weight up to 15kg / 33lbs**

ST8010-4T

1

Pivoting monitor holder for attachment to aluminium profiles of furniture in the SybaPro range. Allows a monitor to be placed in the optimum position so that work and experiments are less tiring.



- Pivoting arm with two-part joint
- Quick-lock for adjustment to any height on extruded aluminium profile
- VESA fastening 7.5 x 7.5cm
- Includes VESA 75 (7.5x7.5) - VESA 100 (10x10) adapter
- 2 Cable clips
- Adequate carrying capacity 15kg / 33lbs
- TFT monitor can be turned parallel to the table edge
- Separation can be adjusted to anywhere between 105 and 480mm

Additionally included:

Cable management set for installing cables along the profiles of the aluminium lab system furniture in the SybaPro range, consisting of:

- 3 Cross cable binders for front and rear grooves of aluminium profile
- 3 Cross cable binders for side grooves of aluminium profile
- 12 Cable binders
- 4 Aluminium cover profiles for covering and enabling wires to be run along the grooves of an aluminium profile

70 **Keyboard adapter for flat screen monitor holders**

ST8010-4G

1

Keyboard adapter for use in combination with flat screen monitor holders



- Mounted between monitor and mount for flat screen monitor holder
- Variable 3-level height adjustment via multiple pre-drilled mounting holes
- Two rows of mounting holes for use with equipment meeting VESA 75 and VESA 100 standards
- Keyboard shelf inclined by about 30° for comfortable and ergonomic usability
- Keyboard shelf with 11-mm folded edging to prevent falling, including handle
- Variable 2-level depth attachment for keyboard shelf (252/276 mm)
- Extra-wide keyboard shelf (640 mm) can accommodate a mouse as well
- Depth of keyboard shelf 172 mm
- Includes two cable clips for guiding and bundling cables
- Maximum load 10 kg
- Dimensions (HxWxD) 360 x 640 x 276 mm

71 **Protection cover for three-level experiment trolleys**

ST8010-9Y

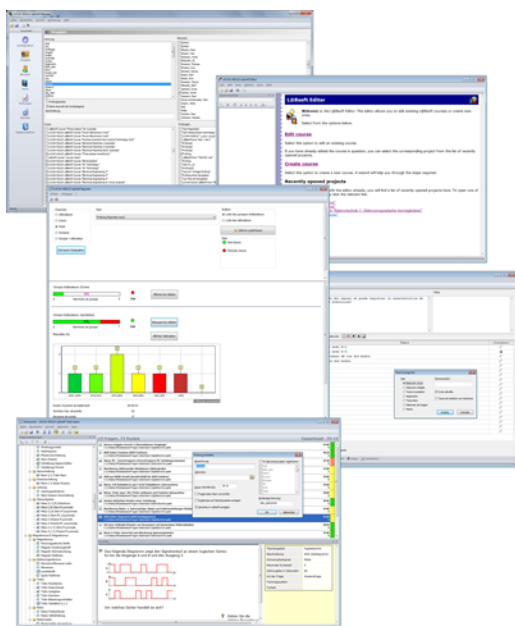
1

Dust cover for three-level experiment trolleys

- For protecting equipment from dust and damp
- For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque)
- Colour: matt dark grey with printed LN logo in orange)
- Material: nylon fabric with polyurethane coating
- High resistant to tearing, impregnated to be washable and waterproof



Recommended learning management software for all LN multimedia courses:

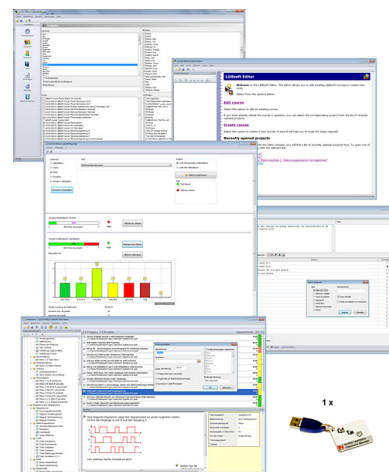


Optionally available: multi user license with 5 or 10 dongles and update to version 4.0

Pos.	Product name	Bestell-Nr.	Anz.
72	LabSoft Classroom Manager 4.0 software suite, single license	SO2001-5A	1

LabSoft Classroom Manager is a comprehensive set of administration software for the UniTrain system and all LabSoft courses. Classroom Manager comprises the following independent program components:

- LabSoft Manager: Administration of students and courses in LabSoft
- LabSoft Reporter: Student reports and statistics
- LabSoft Editor: Creation and editing of courses and tests
- LabSoft Questioner: Creation of questions, measuring exercises and sets of questions for courses and tests
- LabSoft TestCreator: Automatic generation of tests on the basis of sets of questions



Features:

- Ease of use of all programs thanks to graphical user interface in all component programs
- For use in local area networks or on stand-alone PC
- Ease of installation
- No additional database software required
- Access control via USB dongle
- Available languages: DE, EN, ES, FR, RU, PT, ZH, LO

LabSoft Manager:

- Administration of LabSoft network installation
- Administration of an unlimited number of students and courses in LabSoft
- Addition, deletion and editing of courses and tests in LabSoft
- Addition, deletion and editing of students and student data
- Addition, deletion and editing of student groups (classes)
- Assignment of students to classes
- Assignment of courses and tests to students or classes

LabSoft Reporter:

- Electronic monitoring of student progress
- Graphical presentation of progress in courses and tests
- Presentation of student or group results
- Reports on courses, tests, single users or classes
- Summary of results and time
- Calculation of average results for groups
- Multiple search options for students, classes, courses or tests

LabSoft Editor:

- HTML editor for easy to use editing of LabSoft courses
- Editing of course pages
- Wizard for creation of new courses and course pages

- Automatic inclusion of new courses in an existing LabSoft installation
- Automatic creation of IMS-compatible navigation tree without the need for programming knowledge
- Moving course pages within the navigation tree at the click of a mouse
- Editing in WYSIWYG mode
- HTML view and page preview
- Insertion of graphics, animations and tables
- Insertion of test questions
- Page templates for a variety of page types

LabSoft Questioner:

- Program for creating and editing questions, practical measuring exercises and sets of questions (question files) for electronic evaluation
- Easy creation of exercises and questions for courses and tests
- 7 different types of question: single and multiple choice, missing text, assignment, matrices, arbitrary text, selection of images
- Ability to input meta data (points, time for questions, difficulty, required resources, etc.)
- Easy specification of tolerances for practical measuring exercises

LabSoft TestCreator:

- Program for automatically creating electronic tests from sets of questions (question files)
- Automatic and manual selection of questions and measuring exercises
- Filter functions (e.g.: type of question, difficulty) for pre-selection of questions
- Automatic generation of tests according to a set time or number of questions
- Various test options: arbitrary order of questions in a test, immediate display of results after completion
- Automatic registration of tests in LabSoft
- Preview function showing the test as created

Includes:

- CD-ROM with LabSoft Classroom Manager
- 1 USB-dongle for operation of program

System requirements:

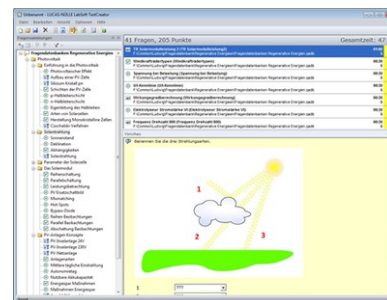
- Server or PC with Windows Vista, 7, 8 or 8.1
- Microsoft Internet Explorer 7.0 or higher
- Minimum 100 MB free disk space
- 1 free USB-port for USB-dongle

73 Collection of assignments Power Engineering / Renewable Energies

SO2001-6D

1

Collection of electronic assignments questions and measuring exercises for the UniTrain courses on the topic of electrical power engineering and renewable energies. With the help of Labsoft TestCreator, these questions and measuring exercises can easily be assembled into electronic tests. The tests can then be carried out in LabSoft.



- A total of some 200 questions and measuring exercises for the UniTrain courses on the topics of Photovoltaics, Fuel cell technology, Transient processes in AC and DC networks and the multimedia course Small wind power plant
- About 25% are practical exercises to be carried using the training systems in order to test handling skills and practical abilities
- About 30% are newly assembled questions previously contained in the courses
- It is possible to extend the collection with your own questions and assignments
- Other collections can be imported
- All questions and assignments can be edited
- 6 different types of questions (single choice, multiple choice, missing text, matching, matrix matching and image choice)
- Extensive metadata for all questions and assignments to make it easier to create tests (degree of difficulty, points, topic area, time to complete, type of question, training systems needed for practical exercises)

EPH 3.4 Investigation of battery storage units in conjunction with photovoltaic systems



EPH 3.4 Investigation of battery storage units in conjunction with photovoltaic systems

Training contents:

- Design and installation of the battery storage unit
- Putting the storage unit into operation
- Interaction between PV systems and storage units
- Boosting intrinsic consumption thanks to energy storage units

Supplement to basic set EPH 3.2, consisting of:

Pos.	Product name	Bestell-Nr.	Anz.
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74 Energy storage system

CO3208-2L

1

Energy storage systems are being used more and more in conjunction with modern solar power systems to promote the automatic boosting of inherent consumption by predicting electrical charging behaviour. The training system consists of a battery storage unit with 3-phase grid inverter, which can feed power into the grid and also extract power from the grid.



Technical data:

- Autonomous battery storage unit to insert into the A4 training panel system:
 - Available battery capacity: 2.0 kWh
 - Nominal power of power inverter: 1.5 kW
 - Max. efficiency of power inverter: 96 %
 - Battery working life: designed for 20 year life span
 - Battery cell chemical constituents: lithium-iron phosphate
 - Charge cycles: > 10,000
 - 7" Multi-touch display
 - Port: Ethernet
 - Automatic reactive power (VAr) control per SCADA
 - Integrated web server
 - Output voltage: 3x400V / 50Hz
- Storage system terminal panel:
 - Grid connection: three-phase, 3x400V
 - 2 power meters
 - 3-phase terminals for PV system and loads
 - 3 x B6A automatic circuit breakers
 - The terminals are accessible on 4 mm safety sockets
- Weight 55 kg
- Dimensions: 700 x 870 x 250 mm (HxWxD)

Accessories:

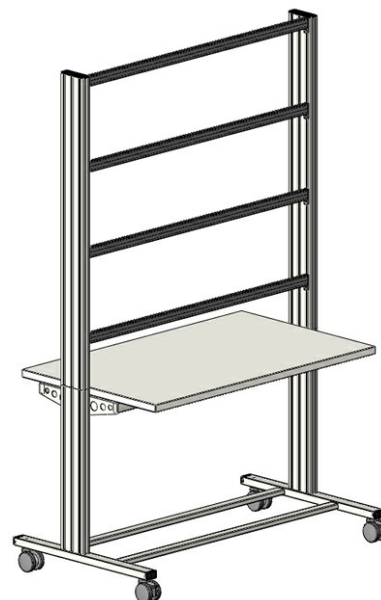
Pos.	Product name	Bestell-Nr.	Anz.
75	Mobile aluminium experiment stand, 3 levels, power strip with 6 sockets, 1250x700x1995mm	ST7200-3A	1

High-quality, mobile experiments stand from the SybaPro range for demonstrations and experiments. Features aluminium profile legs compatible with all add-ons and extensions for the SybaPro system.

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.

Table top:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Table top with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug



Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
- 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
- Space for extension of power supply duct
- Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
- Table frame made of tough combination of rectangular tubing around the full perimeter
- Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1995 x 700 mm (WxHxD)

76 Protection cover for three-level experiment trolleys

ST8010-9Y

1

Dust cover for three-level experiment trolleys

- For protecting equipment from dust and damp
- For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque)
- Colour: matt dark grey with printed LN logo in orange)
- Material: nylon fabric with polyurethane coating
- High resistant to tearing, impregnated to be washable and waterproof



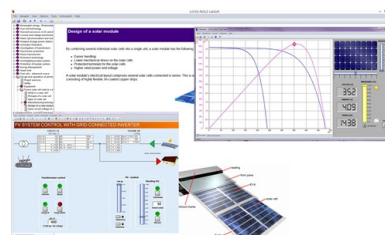
Media:



Pos.	Product name	Bestell-Nr.	Anz.
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77	Interactive Lab Assistant: Professional Photovoltaic Systems	SO2800-3G	1
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The experiment instructions come in the form of an Interactive Lab Assistant course. This multimedia course is a step-by-step guide through the topic of modern photovoltaic energy systems. The physical fundamentals are conveyed using easy to understand animations. The Interactive Lab Assistant in conjunction with the virtual instruments constitutes a comfortable experimenting environment.



Special features:

- Interactive experiment setups
- Measured values and diagrams can be stored in the experiment instructions per drag and drop
- Virtual instruments can be started directly from the experiment instructions
- Includes questions with feedback and evaluation logic for progress monitoring
- Documents can be printed out for hardcopy of experiment instructions including solutions
- CD-ROM with Labsoft browser, course software and virtual instruments
- Course duration 14 h approx.

Software:

Pos.	Product name	Bestell-Nr.	Anz.
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78	Software SCADA Viewer	SO4001-3H	1
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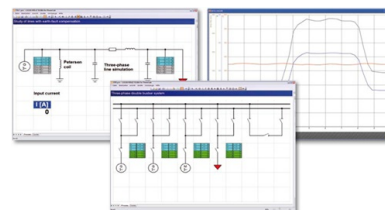
The 'SCADA Viewer' is a software program used for the control and monitoring of power engineering systems. With the software it is possible to display all measured values and operating states inside the system in real time on the existing measuring instruments. Important parameters and signals can be controlled by the software.

The measured values and operating states of the equipment can be selected, recorded and plotted over time, evaluated and then exported.

Using the 'SCADA Viewer' projects in power engineering are not only made transparent but readable.

Software functions:

- Display of measured values and operating states in real time
- Plotting of measured values over time in diagrams
- Processing, analyzing and exporting of diagrams
- The SCADA viewer contains more than 20 predefined projects
- Many projects designed with the SCADA designer can be individually expanded at will



79	Patch cable Cat5E 1x 1m yellow, 2x 2m yellow	LM9057	1
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- 1x 1m yellow
- 2x 2m yellow



80 USB Network Adapter 10/100 BaseTX RJ45

LM9056

1

USB-Ethernet adapter provides simple network access without having to install expansion card. The adapter is thus well-suited especially for cases where there are no more slots available in the PC or the housing should not be opened. This adapter is also an alternative for notebooks: instead of a PC card with an Ethernet port the adapter offers a universal connection option for all PCs with USB interface.



- USB 2.0 high-speed device
- Downward compatible with USB 1.1 and 1.0 Host controllers
- Compatible with IEEE 802.3u, 10/100 Base-T and TX
- Supports both full and half-duplex mode on Ethernet interface
- Operating systems: Windows ME/200/XP/Vista,7 (32+64 Bit), Linux, Mac OS 10.x

81 5-Port Ethernet Switch

LM9988

1

- 5-Port Ethernet Switch
- 5 RJ45 terminals
- Power supply



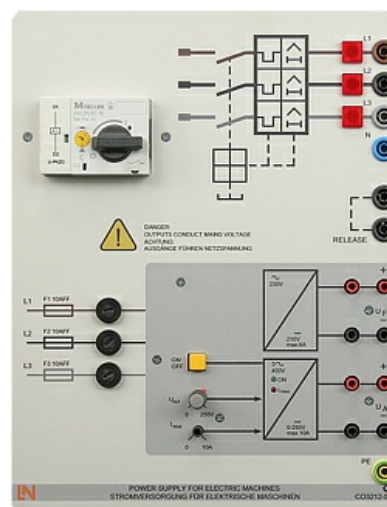
Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
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82	Universal power supply for electrical machines	CO3212-5U	1
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Power supply for DC, AC and three-phase current and for excitation of synchronous machines. The supply is specially designed for use with electrical machines.

- Outputs:
Three phase: L1, L2, L3, N from 4-mm safety sockets
DC: 0...240VDC variable, controlled and electronically protected against overload and short circuits.
Output current: 3...10A (adjustable current limiting)
- Second DC supply ca. 210VDC, 6A fixed
- Protective systems:
Motor protection switch adjustable from 6.3...16A
Undervoltage trip
Safety cut-out
- Power connection: 3x 230/400V, 50/60Hz via CEE plug with 1.8m power lead
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 3kg



83	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1
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Multiple socket outlet, 6 fold, with illuminated switch, 2 pole

- 6 earth pin sockets according to DIN49440, 250V~, 16A
- power cord 1,5m
- Dimensions: 439 x 60 x 44mm (LxWxH)



Measuring instruments:

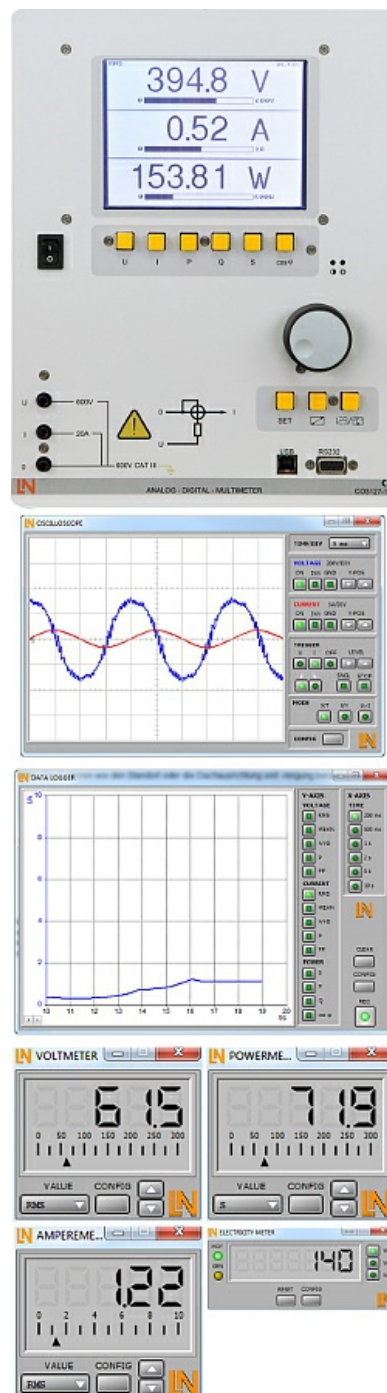
Pos.	Product name	Bestell-Nr.	Anz.
84	Digital/analog multimeter, wattmeter, power-factor incl. software	CO5127-1Z	1

The areas of electrical machines, power electronics and drive technology pose particular problems for measuring instruments. In addition to high-performance overload protection, the acquisition of measurement values must be performed accurately independently of the curve's shape. The universal measuring device has been designed particularly to satisfy these requirements. It can simultaneously replace as many as four different measuring instruments – constituting a current/voltmeter, power and phase-angle meter all in one. The graphic display allows for both student as well demonstration experiments. The VI Starter software included allows for visualisation of measurements on a PC.

- Simultaneous, measurement of voltage and current independent of the curve shape (max. 600 V, 20 A) (measurement of clocked voltages)
- Calculation of active, apparent and reactive power as well as the power factor
- Measurement of the total rms (RMS-AC+DC), AC rms (RMS-AC) and arithmetic mean (AV-AC+DC)
- Impervious to electrical damage up to 20 A/600 V
- Large-scale, high-contrast background-illuminated graphic display (5.7")
- Large-scale display or display of up to 4 measurement values
- Digital or pseudo-analog display
- USB interface
- Internal resistance: current path 10 mΩ, voltage path 10 MΩ
- Voltage ranges: 30, 300, 600 V
- Current ranges: 1, 10, 20 A
- Measurement accuracy: 2%
- Automatic or manual measurement range selection
- Demonstration test instrument for measuring properties of the electricity supply
- Operating voltage: 230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxBxT)
- Weight: 2kg

The VI Starter software allows all the measurements to be displayed on the PC. Up to 17 different displays can be opened.

- Oscilloscope display of voltage, current and power
- Consumption meter to display power consumed and output
- Data logger for 14 different variables
- Data export for data logger
- Characteristic recorder
- Labview driver and supplied examples
- 32-bit version for Windows



The three-phase measuring instrument permits the measurement and display of relevant power network parameters. It is able to measure single, two-phase or three-phase measurements. The display and operation is carried out by means of menu navigation with an LC display or the integrated Ethernet interface. The optional SCADA software provides for the display of all measurements and allows the implementation and analysis of intelligent networks (smart grids). The “smart meter” acts as a digital electricity meter where end customers are connected to the grid in order to measure electricity consumption and can be used to turn consumers on or off depending on the circumstances.

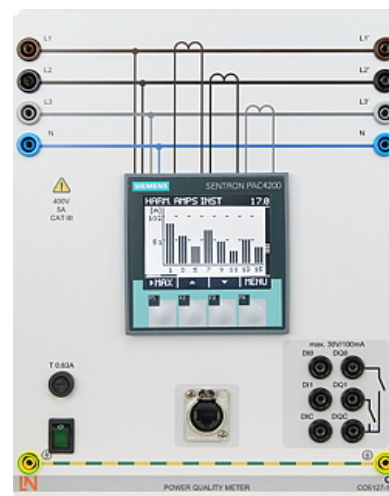
- Three-phase measurement of current and voltage 3x400V/5A
- Measurement of phase voltages, line-to-line voltages and currents
- Determination of the apparent, active and reactive power
- Determination of active, reactive and apparent work
- Determination of the frequency and distortion factors for current and voltage
- Detection of harmonic oscillations and neutral conductor current in the electricity supply
- Pulse measurement
- Peak and mean value detection
- Event logging
- Real-time clock
- Large-scale, contrast-rich graphic display with background illumination
- Display in tables, diagrams and vector diagrams
- 2 Digital inputs and outputs for free configuration including functions
- Ethernet interface
- Menu navigation in German/English/
French/Spanish/Italian/Portuguese/Turkish/
Chinese/Russian/Polish
- Demonstration measuring instrument for making measurements on the electricity supply grid

Max. measurement values:




- Voltage P-P: 690 V
- Current: 5 A

Fault tolerances:

- Voltage 0.2%
- Current 0.2%
- Apparent power 0.5%
- Active power 0.2%
- Reactive power 1%
- Active energy Class 0.2
- Reactive energy Class 2
- Operating voltage: 110V-230V, 50/60Hz
- Dimensions: 297 x 228 x 140mm (HxWxD)
- Weight: 2kg



Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
86	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	SO5126-3R	20
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour black 		
87	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	SO5126-3V	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour blue 		
88	Safety connecting plug 4mm with tap (2x), green/yellow, 1000V/32A CAT II	SO5126-3W	5
	Moulded insulation <ul style="list-style-type: none"> • both sides with touch protection (safety plug + safety sockets), distance 19mm • transition resistance max. 6mΩ • rated data: 1000V/32A CAT II • colour green/yellow 		

89 **Set of safety measurement cables, 4mm (31 leads)**

SO5148-1L

1

Safety measurement cables with 4mm safety plugs, coloured,
PVC insulation, highly flexible



Each set includes the following:

- 6 x 25cm long, black
- 4 x 50cm long, black
- 2 x 100cm long, blue
- 2 x 100cm long, red
- 1 x 100cm long, green/yellow
- 1 x 150cm long, blue
- 1 x 150cm long, green/yellow
- 2 x 150cm long, green
- 4 x 150cm long, brown
- 4 x 150cm long, black
- 4 x 150cm long, grey

- Wire cross section 2.5 mm²
- Capacity/category: 600V CAT II, 32A

90 **Mobile aluminium experiment stand, 3 levels, power strip with 6 sockets, 1250x700x1995mm**

ST7200-3A

1

High-quality, mobile experiments stand from the SybaPro range for demonstrations and experiments. Features aluminium profile legs compatible with all add-ons and extensions for the SybaPro system.

The mobile experiment stand is supplied in kit form and needs to be assembled by customers themselves.

Table top:

- 30-mm table top made of highly compressed, multi-layer fine chipboard conforming to DIN EN 438-1
- Colour grey, RAL 7035, with 0.8-mm slightly textured laminate coating (Resopal) on both sides, conforming to DIN 16926
- Resistant to many chemicals and reagents including dilute acids and alkalis
- Resistant to heat, e.g. molten solder or heating at specific points such as by soldering tips or cigarette ends
- Table top with solid impact-resistant protective edging made of 3mm thick RAL 7047 coloured plastic
- Coating and adhesive are PVC free
- Power strip with 6 outlet sockets mounted underneath the table top, lead and earthed plug



Frame:

- 2 extruded aluminium profiles with multiple grooves 1800 x 120 x 40 mm (WxHxD)
- 8 equally sized grooves in extruded aluminium profiles (3 on each side and 1 each on the front and back)
- Grooves accommodate standard industrial mountings
- 4 H-shaped aluminium profiles, 1150 mm, for 3-layer organisation of DIN A4 panels
- Space for extension of power supply duct
- Base made of rectangular tubing with 4 swiveling double casters, 2 of which have brakes
- Table frame made of tough combination of rectangular tubing around the full perimeter
- Acid-resistant epoxy-resin coating, 80 µm thick (approx.), colour RAL 7047

Dimensions:

- Height of table top 760 mm
- 1250 x 1995 x 700 mm (WxHxD)

91 **Protected power distribution for working stations**

ST8008-8M

1

400-V CEE distribution panel with automatic circuit breakers for attachment to profiles on experiment trolleys or direct to table-top.

- 2 CEE sockets (400 V, 16 A, 5-pole) with safety flap
- 1 Socket outlet with earth (230 V) plus safety flap
- Circuit breaker: 1 x 3-pole line circuit breaker, type B, 16 A
- Power connection: 3 x 230/400 V, 50/60 Hz via CEE plug, 4-m power lead
- Dimensions: 530 x 130 x 110 mm (HxWxD)
- Weight: 3 kg



92 **Wall or aluminium-profile mounting cable storage for 48 cables**

ST8003-8E

1

Accommodates about 48 safety measuring leads (4mm), suitable for mounting on walls or aluminium profiles

- Width 200 mm, 12 guide grooves for leads
- Adjustable height for mounting on aluminium profiles
- Can be mounted on the left or right
- Can be mounted on walls
- Includes 2 screws and tenon blocks
- Acid-resistant epoxy-resin powder coating, thickness 80 µm approx., colour RAL 7047



93 **PC holder for SybaPro experiment trolleys, height/width adjustable**

ST7200-5A

1

Shelf for desktop PC made of 1.5mm sheet steel punched with holes, suitable for all furniture in the SybaPro aluminium profile range

- Adjustable assembly height
- Adjustable width (160 - 255mm)
- Can be mounted to left or right
- Includes all equipment necessary for assembly (4 bolts and 4 tenon blocks)
- Acid-resistant epoxy-resin powder coating, 80µm thick approx., colour RAL7047



94 **Monitor holder for flat screen monitor of weight up to 15kg / 33lbs**

ST8010-4T

1

Pivoting monitor holder for attachment to aluminium profiles of furniture in the SybaPro range. Allows a monitor to be placed in the optimum position so that work and experiments are less tiring.



- Pivoting arm with two-part joint
- Quick-lock for adjustment to any height on extruded aluminium profile
- VESA fastening 7.5 x 7.5cm
- Includes VESA 75 (7.5x7.5) - VESA 100 (10x10) adapter
- 2 Cable clips
- Adequate carrying capacity 15kg / 33lbs
- TFT monitor can be turned parallel to the table edge
- Separation can be adjusted to anywhere between 105 and 480mm

Additionally included:

Cable management set for installing cables along the profiles of the aluminium lab system furniture in the SybaPro range, consisting of:

- 3 Cross cable binders for front and rear grooves of aluminium profile
- 3 Cross cable binders for side grooves of aluminium profile
- 12 Cable binders
- 4 Aluminium cover profiles for covering and enabling wires to be run along the grooves of an aluminium profile

95 **Keyboard adapter for flat screen monitor holders**

ST8010-4G

1

Keyboard adapter for use in combination with flat screen monitor holders



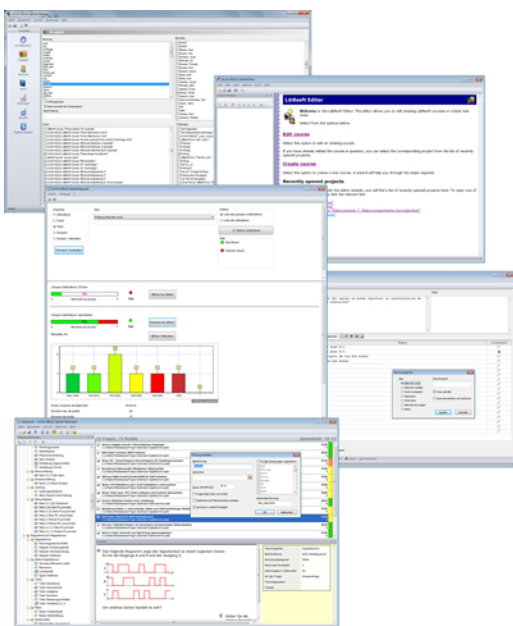
- Mounted between monitor and mount for flat screen monitor holder
- Variable 3-level height adjustment via multiple pre-drilled mounting holes
- Two rows of mounting holes for use with equipment meeting VESA 75 and VESA 100 standards
- Keyboard shelf inclined by about 30° for comfortable and ergonomic usability
- Keyboard shelf with 11-mm folded edging to prevent falling, including handle
- Variable 2-level depth attachment for keyboard shelf (252/276 mm)
- Extra-wide keyboard shelf (640 mm) can accommodate a mouse as well
- Depth of keyboard shelf 172 mm
- Includes two cable clips for guiding and bundling cables
- Maximum load 10 kg
- Dimensions (HxWxD) 360 x 640 x 276 mm

Dust cover for three-level experiment trolleys

- For protecting equipment from dust and damp
- For keeping equipment out of sight (the cover must not be transparent, so is therefore opaque)
- Colour: matt dark grey with printed LN logo in orange)
- Material: nylon fabric with polyurethane coating
- High resistant to tearing, impregnated to be washable and waterproof



Recommended learning management software for all LN multimedia courses:

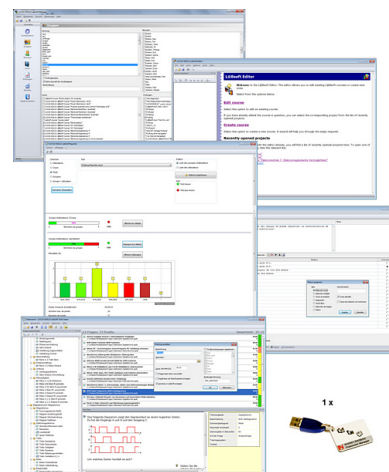


Optionally available: multi user license with 5 or 10 dongles and update to version 4.0

Pos.	Product name	Bestell-Nr.	Anz.
97	LabSoft Classroom Manager 4.0 software suite, single license	SO2001-5A	1

LabSoft Classroom Manager is a comprehensive set of administration software for the UniTrain system and all LabSoft courses. Classroom Manager comprises the following independent program components:

- LabSoft Manager: Administration of students and courses in LabSoft
- LabSoft Reporter: Student reports and statistics
- LabSoft Editor: Creation and editing of courses and tests
- LabSoft Questioner: Creation of questions, measuring exercises and sets of questions for courses and tests
- LabSoft TestCreator: Automatic generation of tests on the basis of sets of questions



Features:

- Ease of use of all programs thanks to graphical user interface in all component programs
- For use in local area networks or on stand-alone PC
- Ease of installation
- No additional database software required
- Access control via USB dongle
- Available languages: DE, EN, ES, FR, RU, PT, ZH, LO

LabSoft Manager:

- Administration of LabSoft network installation
- Administration of an unlimited number of students and courses in LabSoft
- Addition, deletion and editing of courses and tests in LabSoft
- Addition, deletion and editing of students and student data
- Addition, deletion and editing of student groups (classes)
- Assignment of students to classes
- Assignment of courses and tests to students or classes

LabSoft Reporter:

- Electronic monitoring of student progress
- Graphical presentation of progress in courses and tests
- Presentation of student or group results
- Reports on courses, tests, single users or classes
- Summary of results and time
- Calculation of average results for groups
- Multiple search options for students, classes, courses or tests

LabSoft Editor:

- HTML editor for easy to use editing of LabSoft courses
- Editing of course pages
- Wizard for creation of new courses and course pages

- Automatic inclusion of new courses in an existing LabSoft installation
- Automatic creation of IMS-compatible navigation tree without the need for programming knowledge
- Moving course pages within the navigation tree at the click of a mouse
- Editing in WYSIWYG mode
- HTML view and page preview
- Insertion of graphics, animations and tables
- Insertion of test questions
- Page templates for a variety of page types

LabSoft Questioner:

- Program for creating and editing questions, practical measuring exercises and sets of questions (question files) for electronic evaluation
- Easy creation of exercises and questions for courses and tests
- 7 different types of question: single and multiple choice, missing text, assignment, matrices, arbitrary text, selection of images
- Ability to input meta data (points, time for questions, difficulty, required resources, etc.)
- Easy specification of tolerances for practical measuring exercises

LabSoft TestCreator:

- Program for automatically creating electronic tests from sets of questions (question files)
- Automatic and manual selection of questions and measuring exercises
- Filter functions (e.g.: type of question, difficulty) for pre-selection of questions
- Automatic generation of tests according to a set time or number of questions
- Various test options: arbitrary order of questions in a test, immediate display of results after completion
- Automatic registration of tests in LabSoft
- Preview function showing the test as created

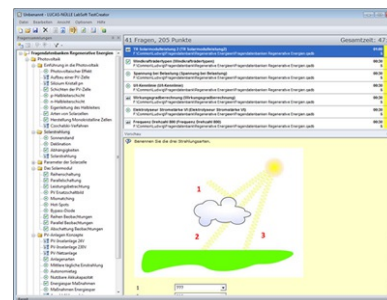
Includes:

- CD-ROM with LabSoft Classroom Manager
- 1 USB-dongle for operation of program

System requirements:

- Server or PC with Windows Vista, 7, 8 or 8.1
- Microsoft Internet Explorer 7.0 or higher
- Minimum 100 MB free disk space
- 1 free USB-port for USB-dongle

Collection of electronic assignments questions and measuring exercises for the UniTrain courses on the topic of electrical power engineering and renewable energies. With the help of Labsoft TestCreator, these questions and measuring exercises can easily be assembled into electronic tests. The tests can then be carried out in LabSoft.



- A total of some 200 questions and measuring exercises for the UniTrain courses on the topics of Photovoltaics, Fuel cell technology, Transient processes in AC and DC networks and the multimedia course Small wind power plant
- About 25% are practical exercises to be carried using the training systems in order to test handling skills and practical abilities
- About 30% are newly assembled questions previously contained in the courses
- It is possible to extend the collection with your own questions and assignments
- Other collections can be imported
- All questions and assignments can be edited
- 6 different types of questions (single choice, multiple choice, missing text, matching, matrix matching and image choice)
- Extensive metadata for all questions and assignments to make it easier to create tests (degree of difficulty, points, topic area, time to complete, type of question, training systems needed for practical exercises)