

Fundamentals of Electrical Engineering

Fundamentals of Electrical Engineering / Electronics

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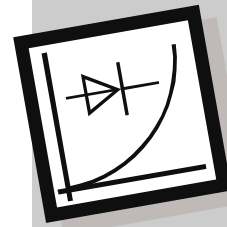
LAB Line

1601	Electronic Lab
1602	Digi Lab
1603	OP Lab
1620.1	USB Measuring Interface

Software

001010	RCLwin
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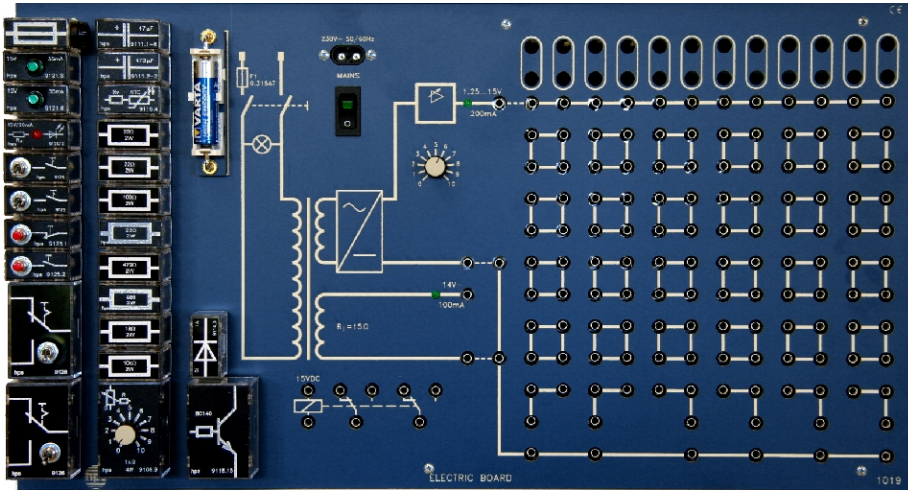
Fundamentals of Electrical Engineering



ELECTRIC BOARD

Type 1019

New
with 4 mm
safety jacks



Front view of the ELECTRIC BOARD

- Universal training and instruction system for non-electrical professions
- With integrated DC and AC sources
- All functions are short-circuit-proof and monitored by LEDs
- Clear arrangement of accessories directly on the basic unit
- Detailed instructions for experiments with solutions
- Components protected against incorrect connection

With the ELECTRIC BOARD, hps SystemTechnik offers a universal training and instruction system which is ideally suited for conducting basic experiments in DC and AC engineering. It is used e. g. in industrial metalworking professions.

The ELECTRIC BOARD has an adjustable DC source and an AC source, both of which are overload-protected and short-circuit-proof.

LEDs indicate the function of both power supply units directly.

4 mm safety jacks are arranged in a 19 mm grid on a jack field. A group of four safety jacks is electrically connected and engraved white.

When setting up a circuit, the individual groups of jacks are connected by plugs or leads and by the pluggable components according to the

given circuit diagram. This reduces the time for setting up the experiments to a minimum.

In order to conduct the experiments, the ELECTRIC BOARD is placed on a table or suspended in an hps rack for demonstration purposes.

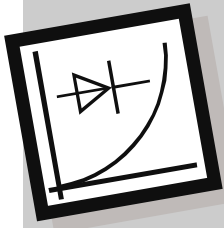
The ELECTRIC BOARD can also be screwed into a Box for safe transport and storage of the ELECTRIC BOARD.

All experiments can directly be conducted in the Box.

The left-hand section of the Board is provided for storing the pluggable components and connecting plugs. The respective circuit symbols are printed on the board thus enabling a clear arrangement.

hps SystemTechnik also offers the „Fundamentals of Electrical Engineering“ experiment manual (Type V 0106) in conjunction with the ELECTRIC BOARD.

It contains numerous experiments with problems and solutions for the following subjects (excerpt):



ELECTRIC BOARD

Type 1019

- The electrical circuit
- Ohm's law
- Electric measuring equipment
- Electric power
- Electric resistors
- Resistors in series
- Resistors in parallel
- Voltage dividers
- Mixed electric circuits
- Electric fuse
- Lamp circuits
- Relay circuits
- Voltage sources in series
- Voltage sources in parallel
- Capacitor
- Diode
- LED
- Transistor as a switch
- Half-wave rectifier
- Logic circuits

Recommended Accessories

- Experiment manual: „Fundamentals of Electrical Engineering” (Type V 0106)

Fundamentals of Electrical Engineering

Technical Data

Mains connection

- Voltage: 230 V AC/115 V AC (110 V AC)
50 ... 60 Hz; approx. 40 VA

DC and AC voltages available on the Board

- DC voltage and current: 1.25 ... 15 V; 0.2 A
- Sinewave voltage and current: 14 V (rms); 0.1 A

The outputs of both voltage sources are short-circuit-proof and monitored by LEDs.

Relay

- Contacts: 2 changeovers
- Contact power: max. 1 A
- Operating voltage: 15 V DC

The individual electric components are connected by 4 mm safety jacks with 4 mm plugs or leads.

Mechanical data

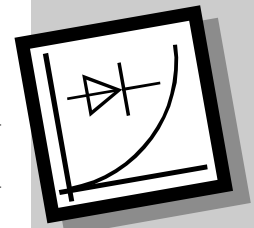
The front panel of the ELECTRIC BOARD is made of 5 mm thick laminate, matt blue colour with white engraving representing the built-in function groups. The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

Dimensions and weights

- Board version (Type 1019):
532 x 297 x 120 mm (w x h x d)
weight: approx. 4.0 kg
- Box version, consisting of:
ELECTRIC BOARD (Type 1019) and
Box (Type 1019.20):
580 x 450 x 155 mm
total weight: approx. 6.6 kg

Subject to technical modifications.

Fundamentals of Electrical Engineering / Electronics



PC BASIC ELECTRONIC BOARD

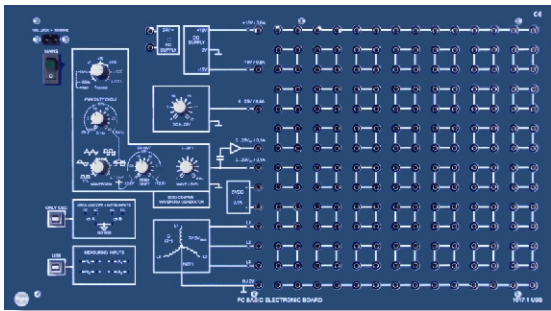
1017.1 USB

PC BASIC ELECTRONIC BOARD with PC-connection

PC BASIC ELECTRONIC BOARD (Type 1017.1 USB)

With USB-Interface (incl. operators software) and the option to upgrade the PC BASIC ELECTRONIC BOARD with the USB-Measuring Interface and the USB-Oscilloscope

NEW!
• PWM Output
• DC Offset Output
• optional:
USB-Oscilloscope



PC BASIC GENERATOR BOARD (Type 1017.1 USB)



PC (not supplied) to control the PC BASIC ELECTRONIC BOARD

- Useable with or without a PC
- If the optional measuring interface incl. measuring software is used, there are two inputs for current and two inputs for voltage available.
- Optional: 2-channel USB-Oscilloscope Type 1018.5 with FFT software.

Set of Accessories Type 1017.11
for the PC BASIC ELECTRONIC BOARD incl. Storage board, consisting of Resistor, Capacitor, Coil, Transformers, Diodes, Transistors, Operational Amplifiers



Set of Accessories (Type 1017.11)

- Universal training and instruction system for the fundamentals of Electrical Engineering / Electronics
- With integrated DC, AC and three-phase current sources as well as a function generator
- Function generator, DC and three-phase current sources short-circuit proof and LED-monitored
- The out signals of the voltage generator can be adjusted precisely with the PC via built-in USB-connection and simultaneously projected with a beamer
- Clear storage of accessories on a separate imprinted Board
- Detailed experiment instructions with solutions

With the PC BASIC ELECTRONIC BOARD hps SystemTechnik offers a universal training and instruction system excellently suited for conducting of fundamentals experiments in Electrical Engineering / Electronics:

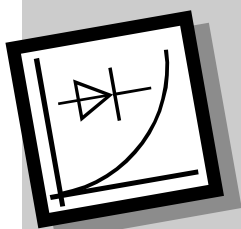
- DC, AC and three-phase current technology
- Characteristics of diodes and transistors
- Characteristics of thyristors and triacs
- Amplifier circuits
- Bridge circuits

The BASIC ELECTRONIC BOARD is equipped, in addition to the power supplies required for conducting the experiments, with a large jack field for setting up experiments with plug-in components. On this jack field, 4 mm jacks are arranged in a 19 mm grid. Four jacks are electrically connected and marked with white printing.

When setting up a circuit, the individual groups of jacks are connected by connecting plugs or leads and by the plug-in components given by the circuit. On this jack field 4 mm safety connecting leads with fixed isolated sleeves are useable.

With the optional measuring interface incl. Measuring software (Type 1018.4) the measured data are easily shown on a PC-monitor.

With the optional USB-Oscilloscope (Type 1018.5) you can view all signals time or frequency based.



PC BASIC ELECTRONIC BOARD

1017.1 USB

Accessories Required

- **Set of Accessories** **Type 1017.11**
consisting of: storage board, resistors, capacitors, semiconductors, transformer coils
- **Set of Accessories** **Type 1017.11.1**
consisting of: connecting leads and plugs
- **Experiment manual** **Type V 0105**
„Fundamentals Experiments in Electrical Engineering / Electronics“ with problems and solutions Section for the following subjects:
 - Electrical Circuit / Ohm's Law
 - Voltage Error Circuit and Current Error Circuit
 - Electrical Resistors
 - Equivalent Voltage Source
 - Series Circuiting of Voltage Sources
 - Parallel Circuiting of Voltage Sources
 - Electrical Power and Work
 - Efficiency of Electrical Power
 - Voltage, Current and Power Matching
 - Establishing and Displaying Characteristics in AC Technology
 - Three-Phase Alternating Current
 - Capacitor in the AC Circuit
 - Coil in the AC Circuit
 - Interconnecting Resistor, Capacitor and Coil Transformers
 - Diodes / Transistors / Thyristors
 - Operational Amplifiers
 - Bridge circuits (Wheatstone-bridge, Thevenin Theorem, Norton Theorem, Maxwell-bridge, Maxwell-Wien-bridge)

Accessories Recommended (optional)

- **USB-Measuring interface** **Type 1018.4**
incl. measuring software to display measured data on a PC-monitor
- **USB-Oscilloscope, 2-channel** **Type 1018.5**
incl. software to view signals time or frequency based

Fundamentals of Electrical Engineering / Electronics

Technical Data

Mains connection

- Voltage: 230 V AC / 115 V AC (110 V AC)
50 ... 60 Hz; approx. 70 VA

AC and DC voltages

- DC voltage:
 - +15 V ($\pm 5\%$); 800 mA
 - 15 V ($\pm 5\%$); 800 mA
 - + 5 V; 100 mA
 - 0 ... 25 V; 300 mA
- AC voltage: 24 V AC; max. 100 mA

Function generator

- Sinewave / Squarewave / Triangal:
 - $U_{pp} = 0 \dots 20 \text{ V}; 100 \text{ mA}$
 - $f = 1 \text{ Hz} \dots 250 \text{ kHz}$
 - $R_i = 60 \Omega$
- Squarewave, positive: $U = 5 \text{ V} / \text{TTL}$
- PWM: 10 kHz; Pulse width 0 ... 100 %
- DC Offset: +12 V ... -12 V

Three-phase current generator

- Phase voltage: $7 V_{eff}$
- Line voltage: $12 V_{eff}$
- Line current: max. 50 mA
- Frequency: approx. 50 Hz

The outputs of the function generator, DC and three-phase current sources are short-circuit-proof and LED-monitored.

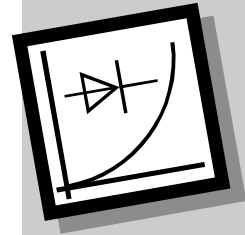
Mechanical Data

The front panel of the PC ELECTRONIC BOARD is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups. The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

Dimensions and weights

- PC BASIC ELECTRONIC BOARD (Type 1017.1 USB):
532 x 297 x 120 mm (w x h x d), weight: 3.9 kg
- Set of Accessories (Type 1017.11):
266 x 297 x 160 mm (w x h x d), weight: 2.2 kg
- Box version, consisting of:
PC BASIC ELECTRONIC BOARD (Type 1017.1 USB),
Set of Accessories (Type 1017.11 and Type 1017.11.1)
and Box (Type 1017.20): 580 x 450 x 200 mm
- total weight: 10.00 kg

Technical changes without prior notice!

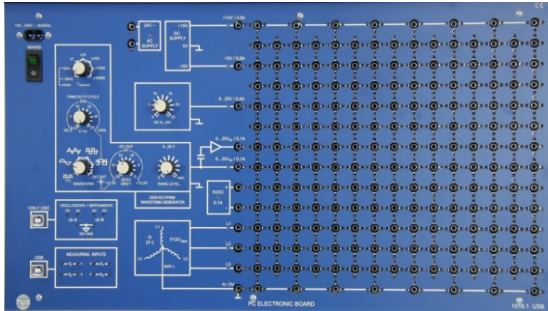


PC ELECTRONIC BOARD with PC-connection

NEW!
• PWM Output
• DC Offset Output
• optional:
USB-Oscilloscope

PC ELECTRONIC BOARD (Type 1018.1 USB)

With USB-interface (incl. operators software)
and the option to upgrade the PC ELECTRONIC BOARD
with the measuring interface and USB-Oscilloscope



PC ELECTRONIC BOARD Type 1018.1 USB



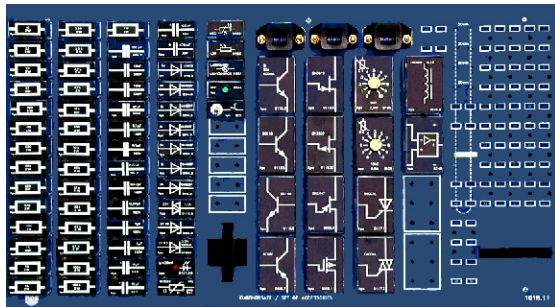
PC ELECTRONIC BOARD

1018.1 USB

- Useable with or without a PC
- If the measuring interface incl. measuring software (1018.4) is used, there are two inputs for current and two inputs for voltage available.
- Optional: 2-channel USB-Oscilloscope with FFT Software

PC (not supplied) to control the
PC ELECTRONIC BOARD
(if the unit is upgraded
Measuring interface and the
measuring software 1018.4)

- Universal training and instruction system for the principles of electrical engineering / electronics / analog technology
- With integrated DC, AC and three-phase current sources as well as a function generator
- Function generator, DC and three-phase current sources short-circuit proof and LED-monitored
- The out signals of the voltage generator can be adjusted with a PC via built-in USB-connection and the operators software. These signals can be simultaneously projected with a beamer
- Clear storage of accessories on a separate imprinted Board
- Detailed experiment instructions with solutions



Set of Accessories
(Type 1018.11)
incl. Storage board

With the PC ELECTRONIC BOARD hps SystemTechnik offers a universal training and instruction system perfectly suitable for conducting following experiments:

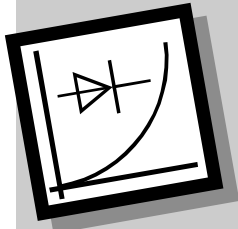
- DC, AC and three-phase current technology
- Characteristics of diodes and transistors
- Characteristics of thyristors and triacs
- Amplifier circuits
- Oscillator circuits
- Modulators and demodulators
- Multivibrators
- Power supply circuits
- Switched power supplies and DC voltage converters
- Power electronic circuits

The PC ELECTRONIC BOARD is equipped, in addition to the power supplies required for conducting the experiments, with a large jack field for setting up experiments with plug-in components. On this jack field, 4 mm jacks are arranged in a 19 mm grid. Each of them is surrounded by and electrically connected to four 2 mm jacks.

When setting up a circuit, the individual groups of jacks are connected by connecting plugs or leads and by the plug-in components given by the circuit. On this jack field 4 mm safety connecting leads with fixed isolated sleeves are useable.

With the optional measuring interface incl. measuring software (1018.4) the measured data are easily shown on a PC-monitor.

With the optional USB-Oscilloscope (1018.5) you can view all signals time or frequency based.



PC ELECTRONIC BOARD

1018.1 USB

To conduct the experiments, the PC ELECTRONIC BOARD is placed on a table or suspended in an hps rack for demonstration purposes.

A Board is provided for storing the plug-in components. The Board is printed with the relevant circuit symbols, allowing simple, clear storage.

The PC ELECTRONIC BOARD is also available in a Box (Type 1018.20). In the Box version the Set of Accessories is screwed into the lid of the Box.

The individual electrical components are connected through 2 mm and 4 mm jacks and plugs.

Accessories Required

- Set of Accessories (Type 1018.11), consisting of: storage board, resistors, capacitors, semiconductors, transformer coils
- Set of Accessories (Type 1018.11.1), consisting of: connecting leads and plugs
- Experiment manuals:
 - Direct Current Technology (Type V 0101 4th Ed.)
 - Alternating Current Technology (Type V 0102 4th Ed.)
 - Semiconductor Components (Type V 0103 4th Ed.)
 - Basic Electronic Circuits (Type V 0104 4th Ed.)

Accessories Recommended (optional):

- Measuring interface (Type 1018.4) incl. measuring software to display measured data on a PC-monitor
- USB-Oscilloscope (Type 1018.5) incl. Software to view signals time or frequency based
- IC BOARD (Type 3530) for additional experiments with commercial components

Fundamentals of electrical engineering / electronics / analog technology

Technical Data

Mains connection

- Voltage: 230 V AC / 115 V AC (110 V AC)
50 ... 60 Hz; approx. 70 VA

AC and DC voltages

- DC voltage:
 - +15 V ($\pm 5\%$); 800 mA
 - 15 V ($\pm 5\%$); 800 mA
 - + 5 V; 100 mA
 - 0 ... 25 V; 300 mA
- AC voltage: 24 V AC; max. 100 mA

Function generator

- Sinewave / Squarewave / Triangal:
 - U_{pp} = 0 ... 20 V; 100 mA
 - f = 1 Hz ... 250 kHz
 - R_i = 60 Ω
- Squarewave, positive: U = 5 V / TTL
- PWM 10 kHz; Pulse width 0 ... 100 %
- DC Offset +12 V ... -12 V

Three-phase current generator

- Phase voltage: 7 V_{eff}
- Line voltage: 12 V_{eff}
- Line current: max. 50 mA
- Frequency: approx. 50 Hz

The outputs of the function generator, DC and three-phase current sources are short-circuit-proof and LED-monitored.

Mechanical Data

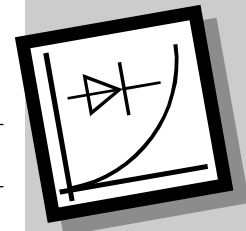
The front panel of the PC ELECTRONIC BOARD is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups. The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

Dimensions and weights

- PC ELECTRONIC BOARD (Type 1018.1 USB):
532 x 297 x 120 mm (w x h x d), weight: 3.9 kg
- Set of Accessories (Type 1018.11):
532 x 297 x 150 mm (w x h x d), weight: 4,0 kg
- Box version, consisting of:
PC ELECTRONIC BOARD (Type 1018.1 USB),
Set of Accessories (Type 1018.11 and Type 1018.11.1)
and Box (Type 1018.20): 580 x 450 x 200 mm
- total weight: 12 kg

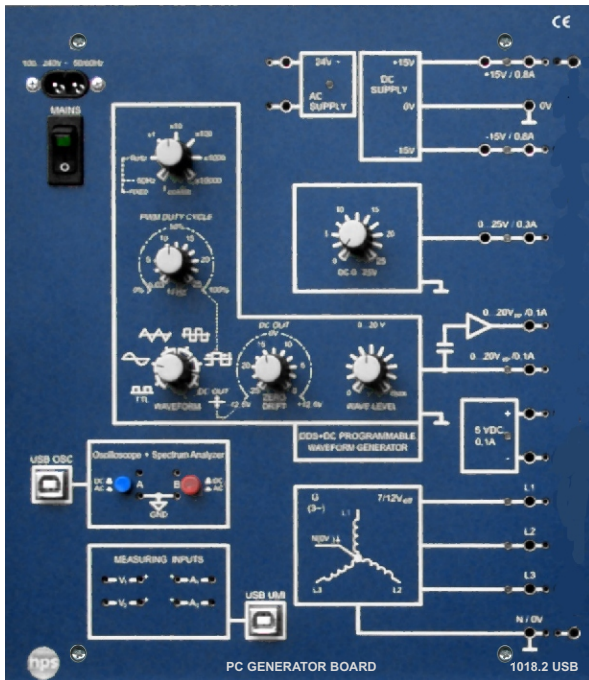
Technical changes without prior notice!

Fundamentals of Electrical Engineering / Electronics



PC GENERATOR BOARD

1018.2 USB



PC GENERATOR BOARD (Type 1018.2 USB)

- All power supplies for principles of electrical engineering/ electronics on one Board
- With integrated DC, AC and three-phase current sources as well as a function generator
- Function generator, DC and three-phase current sources short-circuit proof and LED-monitored
- The out signals of the voltage generator can be adjusted precisely with a PC via built-in USBconnection and the operators software. These signals can be simultaneously projected with a beamer.
- Useable with or without a PC
- If the measuring interface incl. measuring software (1018.4) is used, there are two inputs for current and two inputs for voltage available
- With the optional USB-Oscilloscope (1018.5) you can view all signals time or frequency based

Technical Data

Mains connection

- Voltage:
230 V AC / 115 V AC
(110 V AC)
50 ... 60 Hz; appr. 70 VA

AC and DC voltages

- +15 V ($\pm 5\%$); 800 mA
- -15 V ($\pm 5\%$); 800 mA
- +5 V; 100 mA
- 0 ... 25 V; 300 mA

AC voltage

- 24 V AC; 100 mA

Funktionsgenerator

- Sinewave: $U_{pp} = 0 \dots 20$ V
 $f = \text{appr. } 1 \text{ Hz} \dots 250 \text{ kHz}$
 $R_i = 60 \Omega$

- Squarewave, positive:
 $U_p = 5$ V (TTL)
 $f = \text{appr. } 1 \text{ Hz} \dots 250 \text{ kHz}$
 $R_i = 60 \Omega$
 $V = 2$

- Squarewave:
 $U_{pp} = 0 \dots 20$ V
 $f = \text{appr. } 1 \text{ Hz} \dots 250 \text{ kHz}$
 $R_i = 60 \Omega$
 $V = 2$

- Triangalwave:
 $U_{pp} = 0 \dots 20$ V
 $f = \text{appr. } 1 \text{ Hz} \dots 250 \text{ kHz}$
 $R_i = 60 \Omega$

Three-phase current generator

- Phase voltage: 7V (eff.)
- Line voltage: 12V (eff.)
- Line current: max. 50 mA
- Frequency: appr. 50 Hz

The outputs of the function generator, DC and three-phase current sources are short-circuit-proof and LED-monitored.

Mechanical data

The front panel of the GENERATOR BOARD is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups. The rear of the Board is protected with a grey plastic cover.

Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

The outputs are 2 mm and 4 mm jacks.

Experiment manuals

- Direct Current Technology (Type V 0101 4th Ed.)
- Alternating Current Technology (Type V 0102 4th Ed.)
- Semiconductor Components (Type V 0103 4th Ed.)
- Basic Electronic Circuits (Type V 0104 4th Ed.)

Dimensions / weights

- 266 x 297 x 120 mm (w x h x d)
weight: appr. 2.8 kg

Accessories Required:

- Set of Accessories (Type 1018.11), consisting of: storage board, resistors, capacitors, semiconductors, transformer coils
- Set of Accessories (Type 1018.11.1), consisting of: connecting leads and plugs
- Universal assembly board (Type 1012.1 or Type 1012.2)

Accessories Recommended (optional):

- Measuring interface (Type 1018.4) incl. measuring software to display measured data on a PC-monitor
- USB-Oscilloscope (Type 1018.5)
- IC BOARD (Type 3530), for additional experiments with commercial components



SOFTWARE for 1017.1 USB 1018.1 USB 1018.2 USB

Visualization software

Follow BOARDS can controlled via USB Interface with Personal Computer:

- PC BASIC ELECTRONIC BOARD (Type 1017.1 USB)
- PC ELECTRONIC BOARD (Type 1018.1 USB)
- PC GENERATOR BOARD (Type 1018.2 USB)

Without universal measuring interface (Type 1018.4), you can use only function generator and DC supply 0 ... 25 V. The values of the virtual panels are displayed on PC.

Function generator (useable with and without measurement interface):

- frequency settings: $\approx 2,5 \text{ Hz} \dots 250 \text{ kHz}$
- selection of function: Sine / Square / Triangle / TTL PWM / DC Offset
- amplitude V1: 0 ... 2 V_{pp}
- amplitude V2: 0 ... 20 V_{pp}

DC Source (useable with and without measurement interface):

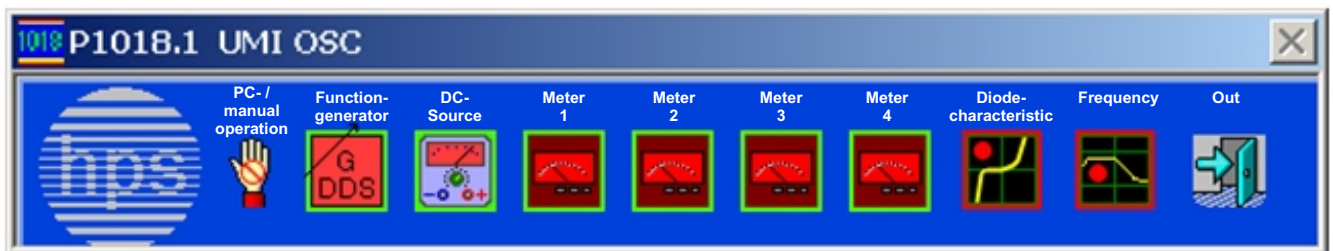
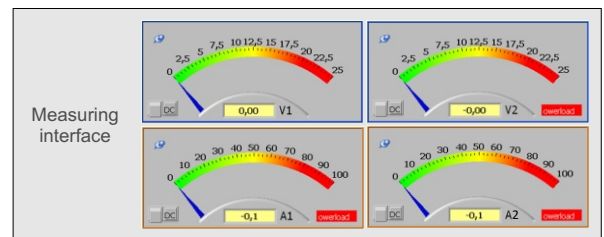
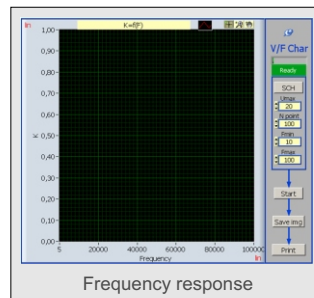
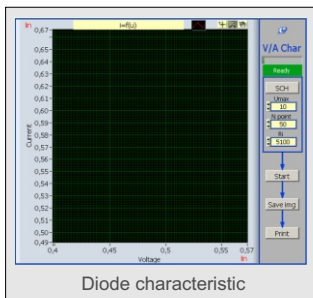
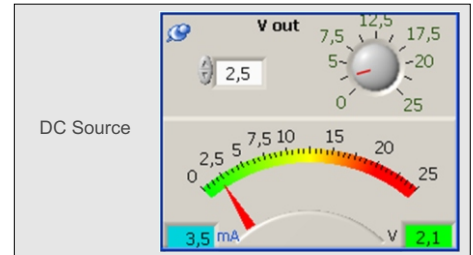
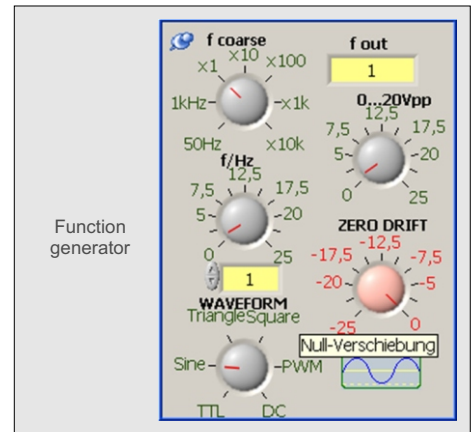
- output voltage: 0 ... 25 V DC

With universal measuring interface (Type 1018.4) additional there are two voltmeter and two amperemeter useable. The values are also displayed on personal computer.

Measuring interface (only useable with interface Type 1018.4):

- 2 voltmeter: 0 ... 30 V AC / DC
- 2 amperemeter: 0 ... 0,1 A AC / DC

PC will be connected with standard USB cable. After starting the visualization software you can select the separate elements.



As soon as you have connected the USB cable and started the visualization software you can control the elements via PC. The elements on the BOARD are disabled. On BOARD there is a group called "MEASURING INPUT" with four galvanically isolated measuring inputs. Through 2 mm jacks the electrical values are transfer to the PC and their you can display two voltmeters and two amperemeters at the same time.

Oscilloscope- and Visualization Software for 1018.5 USB

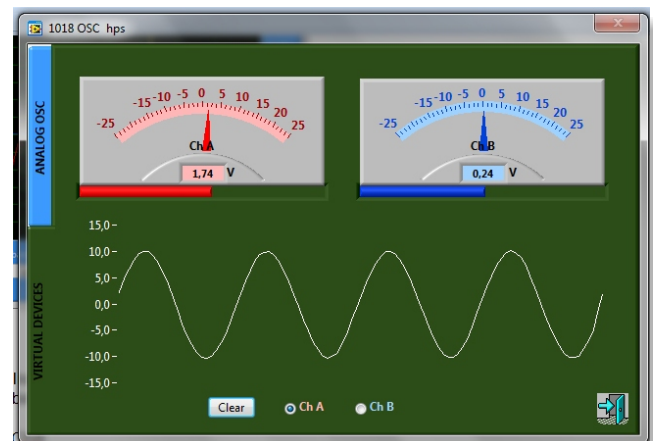
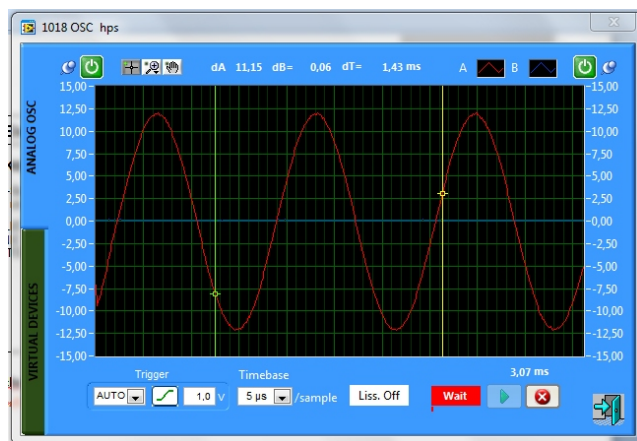
The following boards can be used with the oscilloscope- and visualization software, when the circuit board 1018.5 is placed in the devices.

- PC BASIC ELECTRONIC BOARD (Type 1017.1 USB)
- PC ELECTRONIC BOARD (Type 1018.1 USB)
- PC GENERATOR BOARD (Type 1018.2 USB)



SOFTWARE

1018.5 EVGB



The oscilloscope- and visualization software is used to display simple the measured signals on the USB oscilloscope.

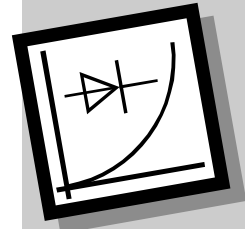
Technical Data:

- 2 channel oscilloscope, Ch A + Ch B
- Separate inputs for DC and AC for each channel, plugged in by 2 mm sockets
- Input voltage max. +/-30 V DC
- Ground : Isolated from the operation ground. (isolated ground)
- USB interface: USB 1.1 or higher
- Operation system: Windows XP / Vista / 7_{32 + 64 bit}

Features of the software:

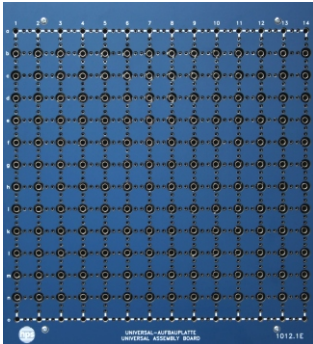
- Display: Each channel can be presented single or together
- Auto scale function (on / off)
- Trigger Auto, channel A or channel B, positive or negative edge
- The X / Y mode, allows a display of lissafigurschen figures
- Variable time base
- Start / stop function, single or cyclic
- Zoom function
- The characteristic of the display of the channels is adjustable (colour, line type and so on)
- Function of virtual display units including writing function to display simple visualizations
- Language: Technical English
- Software on CD-ROM

Fundamentals of Electrical Engineering / Electronics



Universal Assembly Board

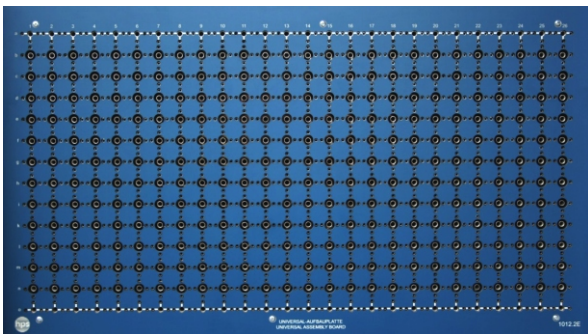
1012.1 E
1012.2 E



Universal Assembly Board Type 1012.1 E

Experiment assembly for different trials for example digitaltechnik modules

NEW!
Useable for 4 mm
safety plugs!



Universal Assembly Board Type 1012.2 E

Experiment assembly for different trials for example basic electronics

- Useable for 4 mm safety plugs!
- For basic and complex experiments in electrical engineering, electronics, analog and digital technology
- Equipped with 4 mm and 2 mm jacks
- High contact load capacity
- Rugged mechanical construction
- Suitable for student exercise and demonstration

The Universal Assembly Board is used in connection with the plug-in components from hps SystemTechnik for solder-free assembly of experiment circuits in all fields of electrical engineering, electronics, analog and digital technology, contained in the hps program.

In addition to its use for demonstration purposes where the Universal Assembly Board is suspended in a rack, it is particularly suitable for equipping student exercise desks.

The Universal Assembly Board enables direct conversion of given circuit diagrams into functional circuits.

This is made much simpler by the circuit symbols which are printed in white on the components to be plugged.

The major advantages of the Universal Assembly Boards are their rugged mechanical construction, the high load capacity of the contacts and the possibility of making connections with miniature plugs below the plug-in compo-

nents to save space in the experiment assembly.

The rear of the Universal Assembly Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

On the jack field of the Universal Assembly Board, 4 mm jacks are arranged in a 19 mm grid. Each of them is surrounded by and electrically connected to four 2 mm jacks.

Technical Data

- Front panel:
5 mm thick laminate, matt blue in colour, with white printing

- Contact load:
max. 10 A

- Contact resistance:
< 0.03

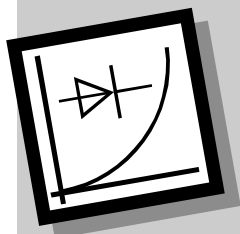
The Universal Assembly Board is available in two sizes:

● Type 1012.1 E

266 x 297 x 90 mm
(Width x height x depth)
weight: 1.25 kg

● Type 1012.2 E

532 x 297 x 90 mm
(Width x height x depth)
weight: 2.4 kg



Experimental Board

1014.1 E
1014.2 E

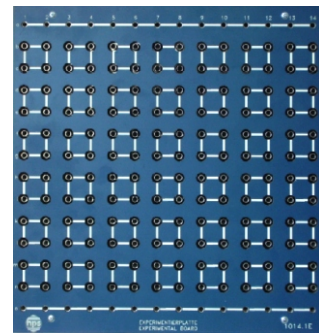
Fundamentals of Electrical Engineering / Electronics

Experimental Board

Type 1014.1 E

Experiment assembly for the fundamentals
of electrical engineering

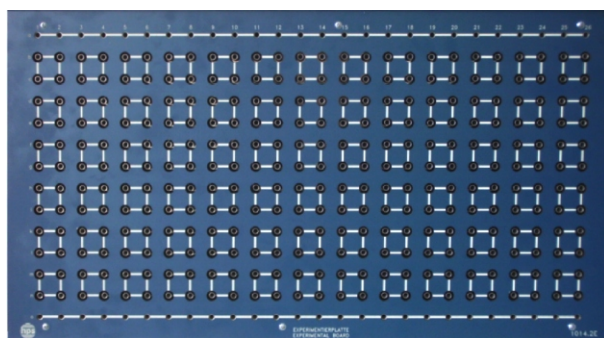
NEW!
Useable for 4 mm
safety plugs!



Experimental Board

Type 1014.2 E

Experiment assembly for the fundamentals
of electronics



- For basic experiments in electrical engineering and electronics
- Equipped with robust 4 mm jacks in a 19 mm grid
- High contact load capacity
- Rugged mechanical construction
- Suitable for student exercise and demonstration

The Experimental Board is used in connection with the plug-in components from hps SystemTechnik for solder-free assembly of simple experiment circuits in electrical engineering and electronics.

In addition to the assembly of demonstration units in which the Experimental Board is suspended in a rack, it is particularly suitable for equipping student exercise and training desks.

The Experimental Board enables direct conversion of given circuit diagrams into functional circuits. This is made much simpler by the circuit symbols which are printed in white on the components to be plugged.

Further major advantages are the rugged mechanical construction and the high load capacity of the contacts.

On the Experimental Board 4 mm jacks are arranged in

a 19 mm grid, electrically connected in groups of four. The electrical connections are marked with white printing on the front of the Board.

The electrical connections necessary for the experiment assembly are made by 4 mm plugs and leads.

Technical Data

- Front panel:
5 mm thick laminate, matt blue in colour, with white printing

- Contact load:
max. 10 A
- Contact resistance:
< 0.03

The Experimental Board is available in two sizes:

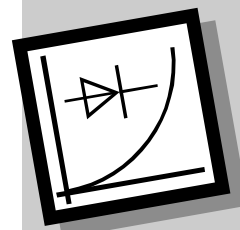
• Type 1014.1 E

266 x 297 x 90 mm
(width x height x depth)
weight: 1.2 kg

• Type 1014.2 E

532 x 297 x 90 mm
(width x height x depth)
weight: 2.3 kg





Module System

Serie 9400 / 9500

Universal Board 1 / Universal Board 2

- Low-cost introduction
- Any power supply units can be used
- Short experiment setup times due to central operating voltage supply
- Available in two sizes

With these two Boards, which differ only in size, hps SystemTechnik offers a low-cost introduction to experimentation in digital technology in connection with the Digital Modules.

The front panel of the Boards is divided into 12 or 24 plug-in locations. These are used for plugging in the Digital Modules and are equipped with four 4 mm jacks each.

The operating voltage for the Digital Modules (+5 V DC) is fed through two of these jacks. The other two jacks are for +/-15 V, e. g. for using analog modules.

A sturdy plastic cover protects the back of the Board. Its shape allows the Board to be placed at an ergonomically favourable angle e. g. on a table.

Technical Data

Operating voltage supply for the Digital Modules

+5 V DC, by external power supply units. It is fed centrally through 2 mm or 4 mm jacks which are electrically connected to the jacks of the individual locations.

Front panel

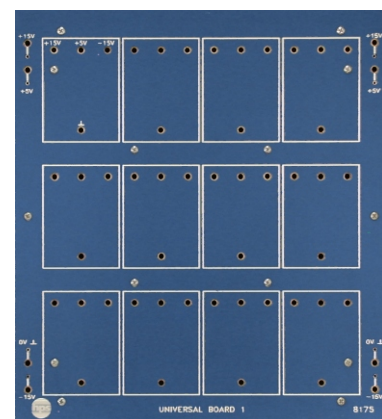
5 mm thick laminate, matt blue in colour, white engraving

Plug-in locations

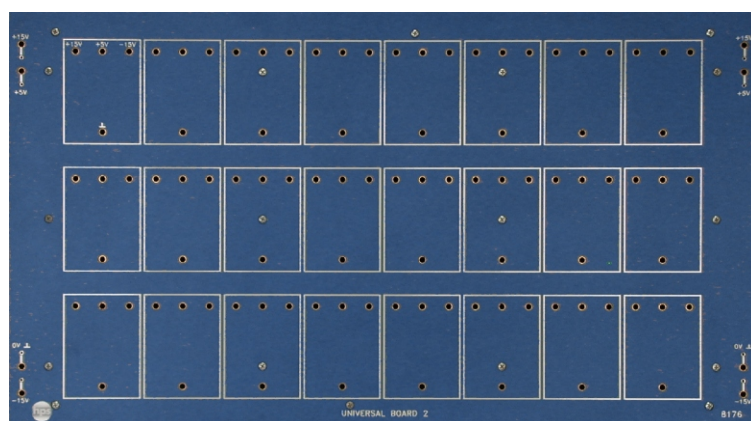
- UNIVERSAL BOARD 1 (Type 8175):
12 with 4 jacks each
- UNIVERSAL BOARD 2 (Type 8176):
24 with 4 jacks each

Dimensions / weight

- UNIVERSAL BOARD 1 (Type 8175):
266 x 297 x 90 mm (w x h x d)
1.33 kg
- UNIVERSAL BOARD 2 (Type 8176):
532 x 297 x 90 mm (w x h x d)
2.65 kg

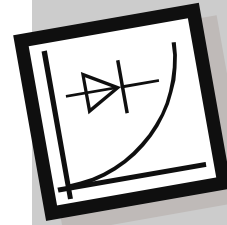


Type 8175



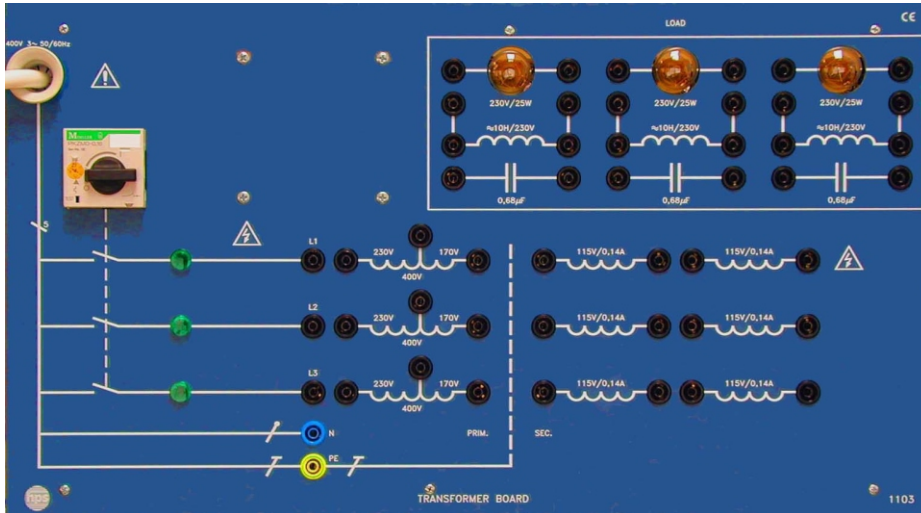
Type 8176

Fundamentals of Electrical Engineering



TRANSFORMER BOARD

Type 1103



TRANSFORMER BOARD (Type 1103)

- All transformer experiments on one Board
- Suitable for single- and three-phase experiments
- With ohmic, inductive and capacitive load
- With built-in protective switch

The following experiments can be conducted with the TRANSFORMER BOARD:

- No-load voltage of the single-phase transformer
- Transmission ratio of the single-phase transformer
- Current and voltage ratios of the single-phase transformer (with ohmic, inductive and capacitive load)
- Transformer losses
- Autotransformer for upward transforming
- Autotransformer for downward transforming
- The three-phase transformer in Yd/Yy/Yz/Dy/Dz circuits
- The phase-multiplying circuit
- Current and voltage ratios of the three-phase transformer (with ohmic, inductive and capacitive load)
- Unsymmetrical load of the three-phase transformer

Subject to technical modifications.

Technical Data

Mains connection

- 5-pole mains cable, approx. 1.5 m long with Cekon plug (CEE standard)
- Conductors: L1/L2/L3/N/PE; indicated by green pilot lamps
- Protective switch: release current 0.1 ... 0.16 A, preset to 0.16 A

Transformer Data

- Primary voltages: 3 x 230 V / 400 V
- Secondary voltages: 6 x 115 V / 0.14 A
- Power: approx. 100 VA

Connectable Loads

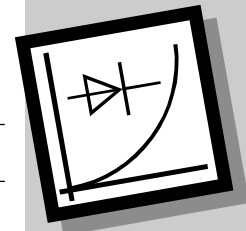
- Ohmic load: 3 lamps, 230 V / 25 W (E14)
- Inductive load: 3 coils, approx. 10 H
- Capacitive load: 3 capacitors, 0.68 μF

Other

- Connection of conductors and connectable loads via safety jacks (4 mm)
- Dimensions / weight: 532 x 297 x 110 mm (w x h x d) / 5.1 kg

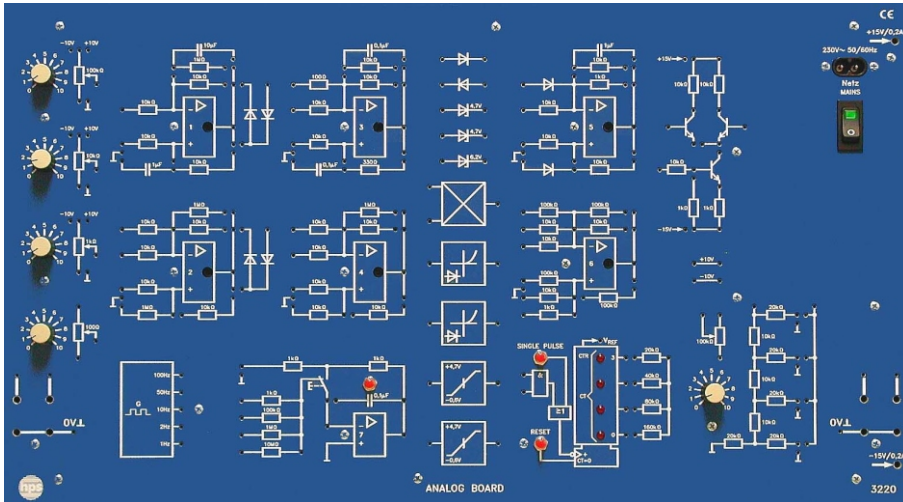
Recommended Accessories

- Experiment manual: „Transformer circuits, single- and three-phase“ (Type V 0171)
- Set of accessories (Type 1103.1), consisting of safety leads and plugs



ANALOG BOARD

Type 3220



ANALOG BOARD (Type 3220)

- Universal teaching and exercise unit for analog technology
- With built-in power supply unit
- Solder-free assembly without additional equipment
- Short setup times
- Unit protected against faulty connection
- Extendable with the IC BOARD

The hps ANALOG BOARD is a compact teaching and exercise unit for demonstration, learning and practical experimentation in the following fields:

- Analog technology
- Analog computing
- Control engineering
- Hybrid technology

The integrated function blocks are shown in symbols on the front panel.

The necessary connections (inputs and outputs) of the operators and networks are fed out at 2 mm jacks.

Connections are made with 2 mm connecting leads and 2 mm plugs.

Built-in 2 mm to 4 mm adapters allow direct connection of measuring and auxiliary equipment.

To conduct the experiments, the ANALOG BOARD is placed on a table or suspended in an hps bench rack for demonstration purposes.

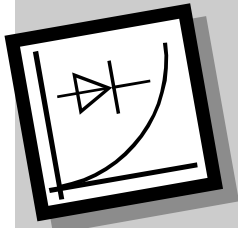
The ANALOG BOARD can also be screwed into a Box for safe transport and storage of the ANALOG BOARD. All experiments can directly be conducted in the Box.

The ANALOG BOARD can also be used in connection with the IC BOARD (Type 3530) to set up additional experiment circuits with commercial components.

The ANALOG BOARD has two voltage outputs (± 15 V; 0.2 A) for connecting external equipment.

hps SystemTechnik also offers the experiment manual „Introduction to Analog Technology” (Type V 0047) for use with the ANALOG BOARD. It contains numerous experiments from basic OP circuits right up to complex experiments in analog technology as well as A/D-D/A conversion.

The manual is divided into an experiments section and a solutions section.



ANALOG BOARD

Type 3220

Function Groups of the ANALOG BOARD

- 6 operational amplifiers with R and RC network
- 1 integrator fully circuited
- 2 squaring networks
- 1 multiplier
- 3 transistors BC 140 with protective and operating resistors
- 1 squarewave signal generator 100 Hz; 50 Hz; 10 Hz; 2 Hz; 1 Hz
- 1 dual counter for DA- AD conversion, with outputs $2^0 \dots 2^3$, AND-input (pulse gate) and 4 LEDs
- 2 R networks (dual network and R-2R network) for experiment DA converter
- 5 potentiometers (0.25 W) 100 k ; 10 k ; 1 k free wiring, for assembly of variable voltage sources
- 6 diodes 1 N 4148 free wiring
- 3 Zener diodes ZPD 4.7 and 6.2, free wiring
- 1 power supply unit for reference voltage (± 10 V; 0.1 A), for internal operating voltage and for connecting external equipment (± 15 V; 0.2 A), short-circuit-proof, stabilised
- 2 level converters ± 15 V to ± 5 V

Fundamentals of Electronics / Analog Technology

Technical Data

Mains connection

- Voltage: 230 V AC / 115 V AC (110 V AC)
50 ... 60 Hz; approx. 40 VA

Mechanical data

The front panel of the ANALOG BOARD is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups.

The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

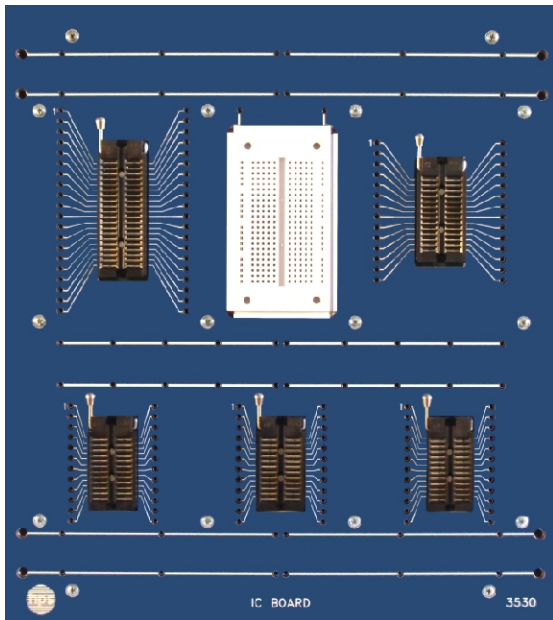
Dimensions and weights

- Board version (Type 3220):
532 x 297 x 120 mm (w x h x d)
weight: approx. 3,4 kg
- Box version, consisting of:
ANALOG BOARD (Type 3220) and
Box (Type 3220.20):
580 x 450 x 155 mm
total weight: approx. 6.6 kg

Recommended Accessories

- Set of Accessories:
consisting of 2 mm connecting plugs and leads (Type 3220.1)
- IC BOARD:
for experimenting with commercial components (Type 3530)
- Experiment manual:
„Introduction to Analog Technology“
(Type V 0047)

Subject to technical modifications.



Front view of the IC BOARD

With the IC BOARD hps SystemTechnik offers a universal device ideally suitable for setting up experiments with commercial components in the specialist fields listed below:

- **Basic electronics**
- **Analog technology**
- **Digital technology**
- **Microprocessor technology**
- **Automatic control engineering**
- **Communications**

The following components are arranged on the front panel of the IC BOARD:

- 3 IC sockets (24-pin) for DIL-ICs with quick-action clamp
- 1 IC socket (28-pin) for DIL-ICs with quick-action clamp
- 1 IC socket (40-pin) for DIL-ICs with quick-action clamp
- Bread Board for connecting components like Resistors, LEDs and capacitors. 10 rows, each of it have 23 pins. Diameter of components: 0,4 ... 1,0 mm

- Universal exercise unit for assembling circuits with commercial components
- Fast experiment setup without soldering
- Great flexibility owing to the possibility of connecting any operating voltage
- Universally combinable with external equipment
- Can be used in the whole field of electronics
- Possible interconnection of several

IC BOARD

Type 3530

The front panel of the IC BOARD has two rows of 2 mm jacks at the top and bottom edges and in the middle. These allow power supply units and measuring devices to be connected and serve as distributors for assembled circuits as well as through-connections to other units or additional IC BOARD.

Each row of jacks is divided in the centre for better exploitation but can be joined by 2 mm plugs.

The upper and lower two rows of jacks are equipped with an additional 4 mm jack on the right and left hand sides for universal adaptation.

The connections of all IC sockets are fed externally through 2 mm jacks so that all the electrical connections of a circuit can be made with 2 mm connecting leads.

To conduct the experiments, the IC BOARD is placed on a table or suspended in an hps rack for demonstration purposes.



IC BOARD

Type 3530

Recommended Accessories

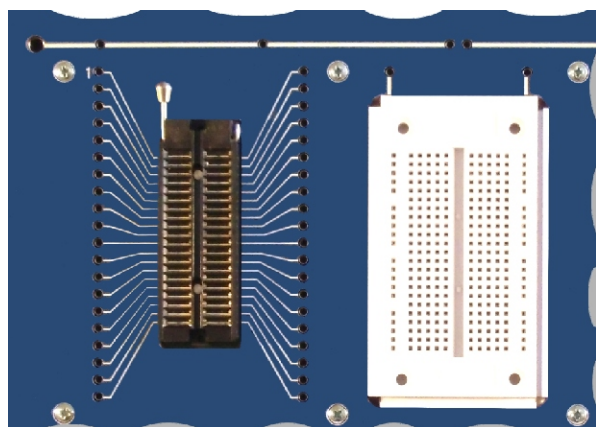
- Set of Accessories (Type 3530.1), consisting of connecting leads and plugs

Mechanical Data

The front panel of the IC BOARD is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups.

The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

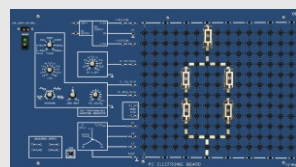
- Dimensions: 266 x 297 x 90 mm (w x h x d)
- Weight: approx. 1.25 kg



Bread Board

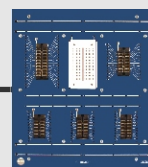
Fundamentals of Electronics / Analog and Digital Technology

Possible Combinations of the IC BOARD with Other hps Units



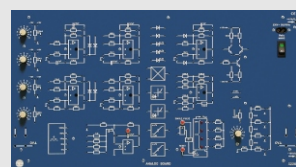
ELECTRONIC BOARD

Type 1018



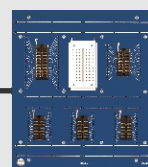
IC BOARD

Type 3530



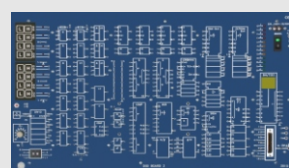
ANALOG BOARD

Type 3220



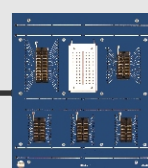
IC BOARD

Type 3530



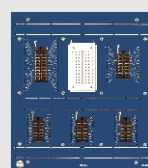
DIGI BOARD 2

Type 3910



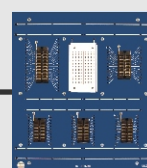
IC BOARD

Type 3530



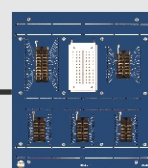
IC BOARD

Type 3530



IC BOARD

Type 3530

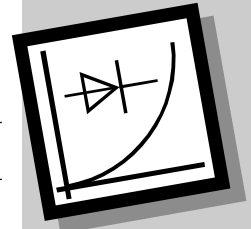


IC BOARD

Type 3530

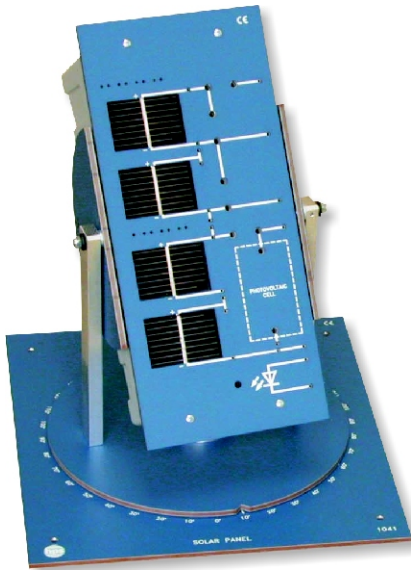
Subject to technical modifications.

Fundamentals of Electrical Engineering / Photovoltaics

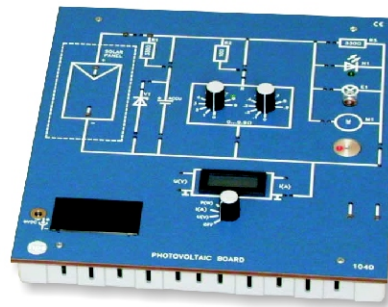


PHOTOVOLTAIC BOARD, Type 1040

SOLAR PANEL Type 1041



SOLAR PANEL (Type 1041)

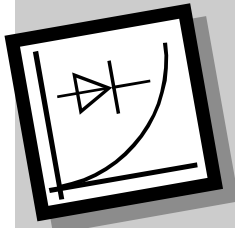


PHOTOVOLTAIC BOARD (Type 1040)

- **Mains-independent training system for photovoltaics**
- **Experiments possible with natural sunlight or in the laboratory with a lamp**
- **Angle of inclination and rotation of the SOLAR PANEL can be set exactly using the printed scale**
- **String and bypass diodes can be plugged directly to the SOLAR PANEL**
- **PHOTOVOLTAIC BOARD with resistor decade, four different consumers and energy Stores (GOLD CAP)**
- **Current, voltage and power meter integrated in the PHOTOVOLTAIC BOARD**

Experiments with photovoltaics

- **Physical principles**
 - The LED as a photoelement
 - The solar cell as a diode
 - Investigation of various light sources
- **Investigation of solar cells**
 - No-load voltage and short-circuit current at different luminous intensities
 - No-load voltage and short-circuit current with partially covered solar cell
 - Power characteristic and filling factor
 - Temperature behaviour of a solar cell
 - Influence of the incident radiation angle on current, voltage and power
- **Structure of solar modules**
 - Series and parallel circuiting of solar cells
 - Behaviour in the event of partial shadowing
 - Bypass or shunt diodes
 - Blocking or string diodes
- **Energy stores**
 - Charging and discharging
 - Discharge protection
 - Currents in an isolated system (island)
 - Loading with various consumers



PHOTOVOLTAIC BOARD, Type 1040

SOLAR PANEL Type 1041

Fundamentals of Electrical Engineering / Photovoltaics

Technical Data

PHOTOVOLTAIC BOARD, Type 1040

- Resistor decade, for recording the power characteristics of solar cells
Resistance range:
0 ... 9.9 (in steps of 0.1)
10 ... 19.9 (with series resistor 10)
- 4 consumers
Resistor: 330
LED: green
Filament lamp: 3.8 V / 70 mA
Solar motor: 5.9 V / 50 mA
- Energy store: 1 F (Gold Cap), with Z-Diode (1.5 V) for voltage limiting and charging resistor 330
- Meter, built-in
Voltage measuring range: 0 ... 19.99 V
Current measuring range: 0 ... 1.999 A
Power measuring range: 0 ... 1.999 W
Operating voltage for meter: 9 V DC (by battery or via external power pack)
- Dimensions / weights:
266 x 297 x 110 mm (w x h x d) / weight: approx. 1.4 kg

SOLAR PANEL, Type 1041

- Swivellable and rotatable, with degree scale
- 4 solar cells, monocrystalline:
- $U_L = 0.6 \text{ V}$; $I_K = 0.54 \text{ A}$, built-in
- 1 additional slot for solar cell
- 1 LED (clear)
- Dimensions / weights:
266 x 297 x 350 mm (w x d x h) / weight: approx. 1.95 kg

Lamp, Type 1042

- 230 V / 120 W (PAR 38)
- Dimensions / weights:
133 x 297 x 210 mm (w x h x d) / weight: approx. 1.25 kg

Solar Module, Type 1041.1

- Solar cell, polycrystalline: $U_L = 0.55 \text{ V}$; $I_K = 0.43 \text{ A}$, for inserting in the SOLAR PANEL
- Dimensions / weights:
60 x 70 x 31 mm (w x h x d) / weight: approx. 50 g

Common technical data

Mechanical data

The front panels of the PHOTOVOLTAIC BOARD and the SOLAR PANEL are made of 5 mm thick laminate, matt blue with white engraving. The rear is covered by a grey plastic protective cover.

Accessories for the photovoltaic training system



Lamp (Type 1042)



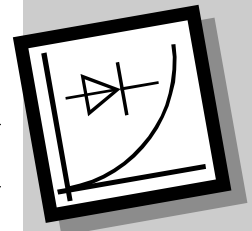
Solar Module (Type 1041.1)

Recommended Accessories

- Experiment manual: „Experiments with Photovoltaics“ (Type V 0107)
- Set of Connecting Leads and Plugs (Type 1040.1)
- Set of Accessories (Type 1040.2), consisting of plug-in power pack, 3 pluggable diodes and cover plate for shadowing a solar cell with foil to simulate contamination.

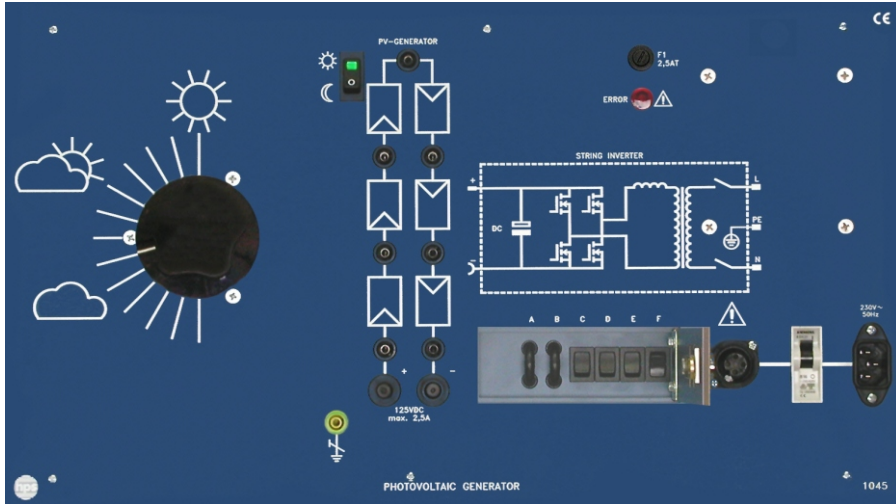
Subject to technical modifications.

Fundamentals of Electrical Engineering / Photovoltaics

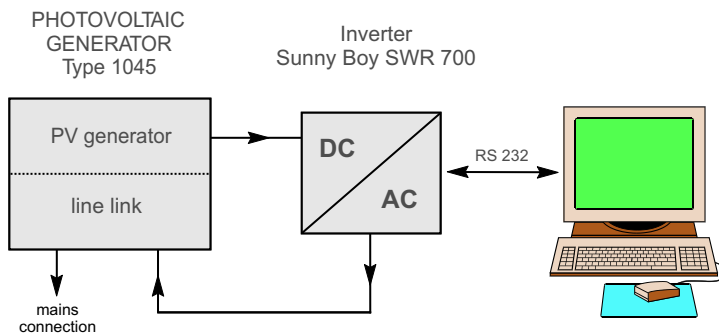


Training System Photovoltaic

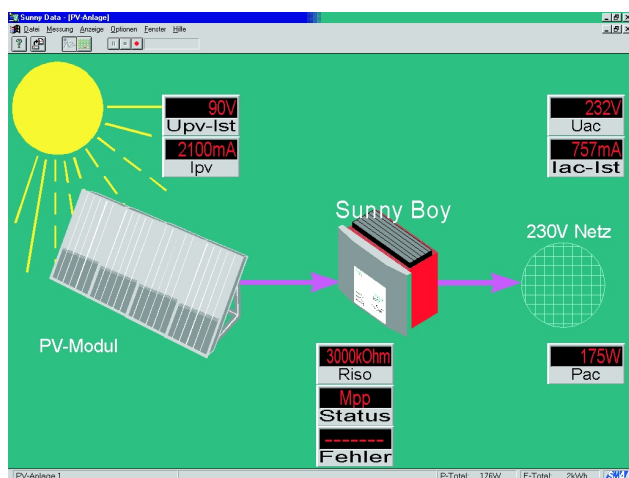
Type 1045.1



PHOTOVOLTAIK GENERATOR (Type 1045)



Schematic diagram of the Training System Photovoltaic



Measured values of the PV system, shown with the Sunny Data software

Complete training system for line-linked PV systems

Simulation of a PV generator and mains connection of the inverter on one board

Continuously adjustable „radiated light energy” enabling measurements regardless of the weather and the time of day

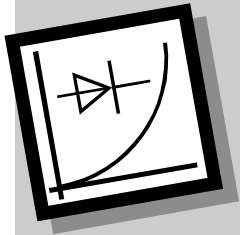
U/I behaviour of the „PV modules” the same as in practice

Voltage measuring points on every single module

With error simulation on the PV generator and the mains feed

Examination of different operating points of a commercially available inverter

Comfortable measured value display and system monitoring with Sunny Data software



Training System Photovoltaic

Type 1045.1

Fundamentals of Electrical Engineering / Photovoltaics

Technical Data of the PHOTOVOLTAIC GENERATOR (Type 1045)

PV-generator

- 6 PV modules, max. approx. 20 V / 2.5 A
- With built-in bypass diodes
- Error simulation: partial shadowing of the PV generator, failure of a bypass diode, insulation error (The error simulation has a lockable door.)

Mains feed

- Fused by automatic 6 A fuse
- Error simulation of the mains impedance with different values; for monitoring the automatic release point ENS (The error simulation has a lockable door.)

Mechanical data

The front panel of the PHOTOVOLTAIC GENERATOR is made of 5 mm thick laminated Board, matt blue in colour with white engraving. The back is protected by a grey metal housing.

- Dimensions / weight: 532 x 297 x 200 mm (w x h x d) / 13.7 kg

Technical Data of the Sunny Boy SWR 700 inverter



- Input voltage ranges DC: 75 V ... 150 V
- Input current $I_{PV \text{ max}}$: 6.2 A
- Rated output power $P_{AC \text{ rated}}$: 700 W
- Working range AC U_{AC} : 196 V ... 253 V
- Working range frequency f_{AC} : 49.8 Hz ... 50.2 Hz
- Interface: RS 232

Mechanical data

Dimensions / weight:
322 x 290 x 180 mm (w x h x d) / 16 kg

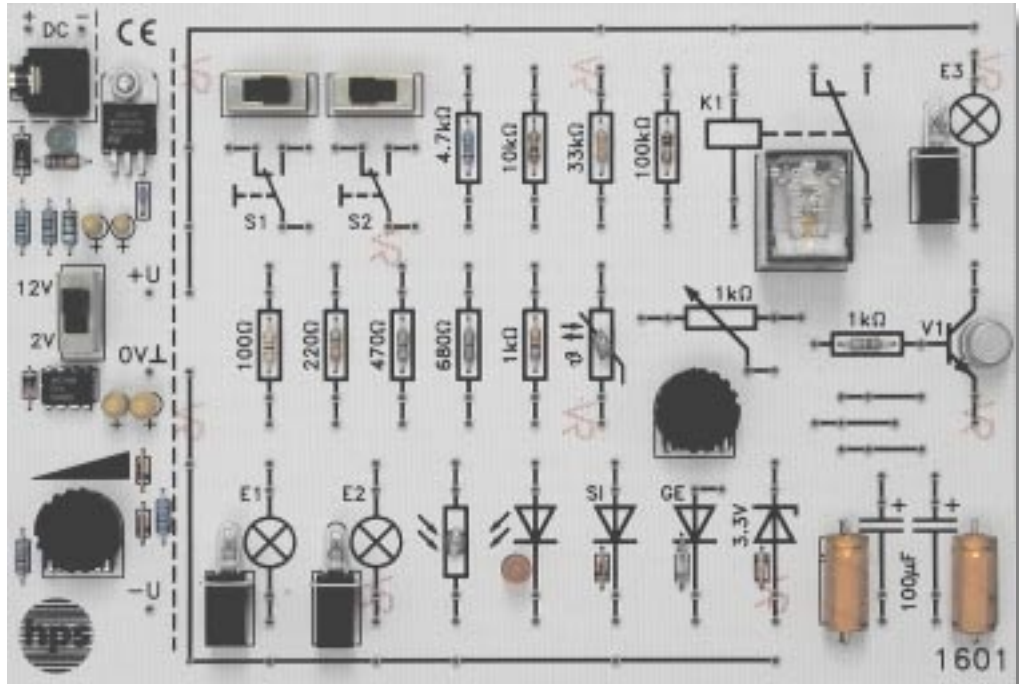
Sunny Data Software

- Continuous acquisition of operating data of the connected inverter
- Monitoring of the operating states and reporting of operating faults
- Online measured data transfer and graphic display of data
- Measuring channels which can be called by the Sunny Data software:
- Actual value PV voltage, setpoint PV voltage, mains current, mains voltage, mains frequency, mains power, mains impedance, insulation resistance, Sunny Boy total energy, Sunny Boy operating hours, Sunny Boy mains connections, Sunny Boy error counter, Sunny Boy operating status and Sunny Boy error status

Subject to technical modifications

ELECTRONICLAB – a solid basis

for basic experiments in electrical engineering / electronics



ELECTRONICLAB (Type 1601)

- All the components and power sources required for the experiments are integrated in a clear arrangement:
 9 resistors, 1 potentiometer, 1 NTC, 1 LDR, 3 diodes, 1 LED, 1 NPN transistor,
 3 lamps, 2 electrolytic capacitors, 1 relay, 2 change-over switches,
 2 voltage sources (0 ... 12 V DC, -7 V DC)
- Optimum contacting by gold-plated spring connections: no corrosion,
 low contact resistance
- Also available as a kit for practical soldering exercises,
 with detailed instructions

Workbook for *ELECTRONICLAB*

The workbook available for the *ELECTRONICLAB* contains numerous experiments for the following topics:

- | | |
|------------------------------------|---|
| ■ Electrical circuits | ■ Non-linear resistors |
| ■ Basic electrical units | ■ Capacitors |
| ■ Handling measuring equipment | ■ Diodes |
| ■ Electric resistances | ■ LEDs |
| ■ Ohm's law | ■ Zener diodes |
| ■ Series circuiting of resistors | ■ Bipolar transistors |
| ■ Voltage divider circuits | ■ Electromagnetism |
| ■ Parallel circuiting of resistors | ■ Alternating current technology |
| ■ Lamp circuits | ■ Rectifier circuits |
| ■ Electrical power and work | ■ Series and parallel circuits of voltage sources |

Technical data

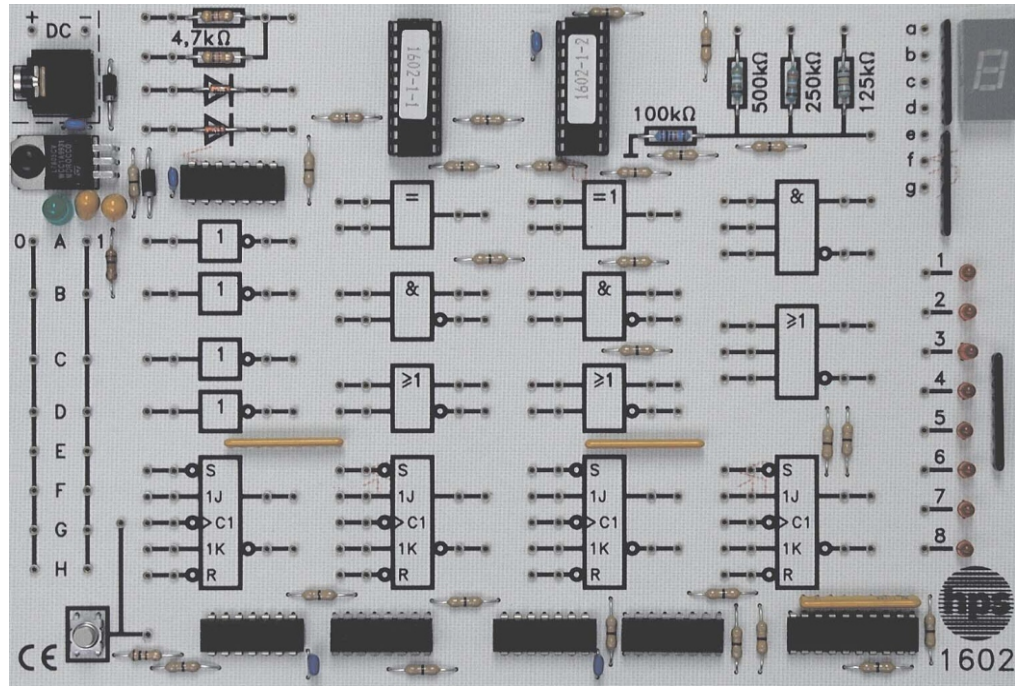
- Power supply: 12 V DC (from plug-in power pack provided)
- Variable output voltage: 0 ... 12 V
- Fixed output voltage: approx. -7 V
- Dimensions of board: 190 mm x 130 mm

Recommended measuring equipment

- Simple multimeter
- hps Measuring Interface (type 1620.1)
(function generator and measured value acquisition in connection with a PC)

DIGILAB – the introduction to the world of bits and bytes

For basic experiments in digital engineering



DIGILAB (Type 1602)

- All the functions groups required for the experiments are integrated in a clear arrangement:
 3 AND/NAND gates, 3 OR/NOR gates, 4 inverters, 1 equivalence gate, 1 antivalence gate,
 4 JK flipflops, 1 display (7-segment), 8 LEDs, 1 pushbutton, 1 resistor network, 2 diodes,
 jacks for 0/1 states
- Operable immediately after connecting the operating voltage (plug-in power pack)
- Experiments in basic logic circuits possible without additional measuring equipment
- Experiments in sequential and applied circuits in connection with the
 hps Measuring Interface

Workbook for *DIGILAB*

The workbook available for the *DIGILAB* contains numerous experiments for the following topics:

- Comparison between analog and digital technology
- Logical basic circuits
- TTL circuits in practice
- Assembled digital engineering components
- Digital technology in practice
- Laws of switching algebra
- Simple circuits with logic gates
- Complete disjunctive and conjunctive normal form
- Analysis of logic switching networks
- Bistable elements
- Counters
- Register circuit
- Code converters
- Arithmetic circuits
- Digital / analog converters
- Analog / digital converters
- Displays

Technical data

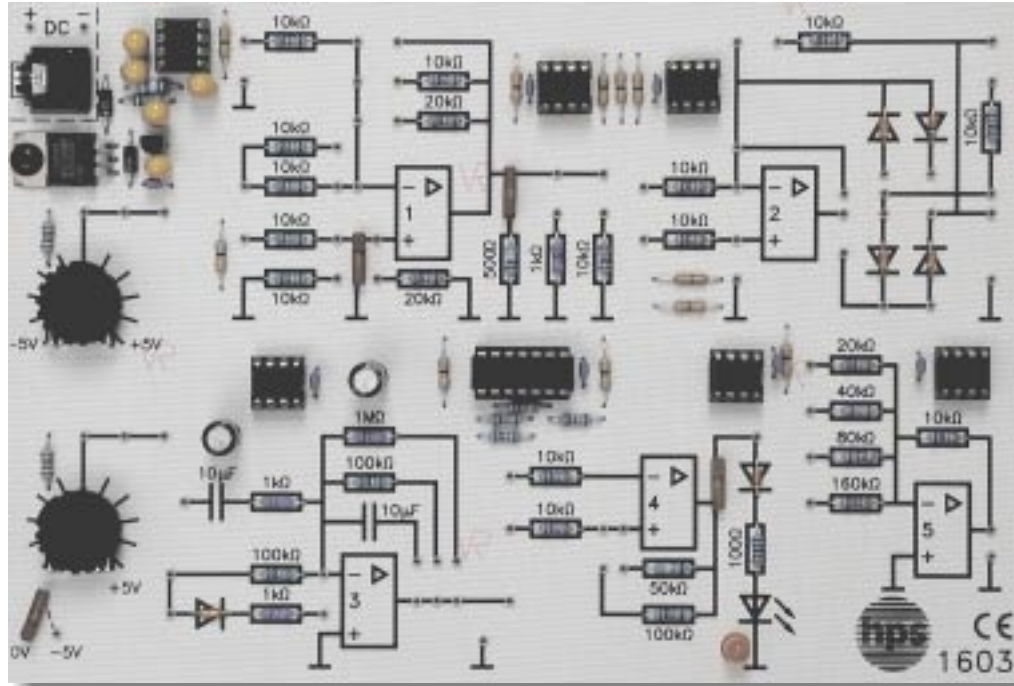
- Power supply: 12 V DC (from plug-in power pack provided)
- Internal supply voltage: 5 V (TTL)
- Dimensions of the board: 190 mm x 130 mm

Recommended measuring equipment

- hps Measuring Interface (type 1620.1),
to conduct experiments with sequential and applied circuits as well as for multi-channel display and documentation of clock and output signals

OPLAB — the multi-talented operational amplifier

For experiments in analog circuitry

**OpLAB** (Type 1603)

- **All components and voltage sources are arranged in a way to become functional circuits by merely plugging a few connecting bridges or lines.**
- **5 operational amplifiers are available for setting up the most common OP circuits:**
 - OP1: inverting and non-inverting amplifier with variable wiring of resistors
 - OP2: rectifier circuits
 - OP3: integrator / differentiator
 - OP4: comparator circuits with and without hysteresis
 - OP5: D/A convertersMoreover several Ops can be interconnected for setting up a sawtooth generator for instance.
- **The required input signals for the OP circuits are supplied by two variable voltage supplies integrated in the board or by the Measuring Interface, type 1620.**

Workbook for *OPLAB*

The workbook available for the *OPLAB* contains numerous experiments for the following topics:

- | | |
|--|--------------------------------|
| ■ Introduction into the theory of the operational amplifier technology | ■ Comparator |
| ■ Inverting basic circuit | ■ Schmitt trigger |
| ■ Non-inverting amplifier | ■ Precision rectifier |
| ■ Impedance transformer | ■ Integrator |
| ■ Adder | ■ Delta and sawtooth generator |
| ■ Subtractor | ■ Differentiator |
| ■ Differential-mode voltage amplifier | ■ Digital/analog converter |

Technical data

- Power supply: 12 V DC (from plug-in power pack provided)
- Internal supply voltage: ± 7 V
- Dimensions of board: 190 mm x 130 mm

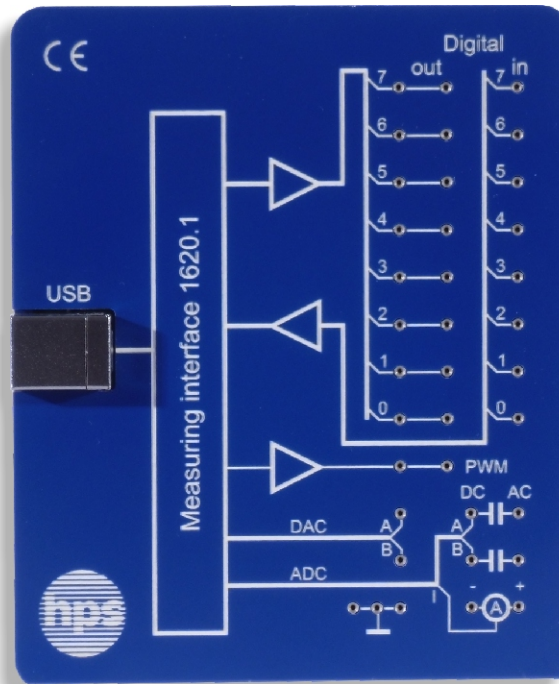
Recommended measuring equipment

- Simple multimeter
- hps Measuring Interface (type 1620.1)
(function generator and measured value acquisition in connection with a PC)

USB Measuring Interface

with Measuring- and Visualization Software

The additional technical measurement for LabLine and other hps products



Measuring Interface (Type 1620.1)

Technical Datas Hardware

Interface:	- USB 1.1 or higher	ADC A / B:	- Analogue digital converter - Two inputs (A / B) - Input voltage 0 ... +/- 10 V, DC or AC - Separate input for DC and AC per channel
Digital:	- 8 outputs (OUT D0-D7) Level OUT / IN 5 V TTL Output current max. 15 mA - 8 inputs (IN D0- D7) Level IN 5 V TTL Input voltage max. +5.5 V	Ammeter:	- For measuring current DC / AC - Input voltage max. +/- 10 V - Input- / current range +/- 30 mA
PWM:	- Pulse width modulation Output 0 ... 100 kHz, square Pulse width adjustable from 0 ... 100 % Output voltage 5 V, +/-10 % Output current max. 30 mA	Dimensions:	- Length 90 mm - Height 110 mm - Depth 15 mm
CAC A / B:	- Digital analogue converter - Two outputs (A/B) - Output voltage adjustable 0 ... +/-5 V - DC offset adjustable -5 V / +5 V - Signal forms adjustable via software DC, sine, saw tooth, square - Output current max. 30 mA	Weight:	- Approx. 150 g
		Material:	- Laminate
		Colour:	- Navy blue
		Symbols:	- White lasered

Technical Data Software (1620.1 EVGB)

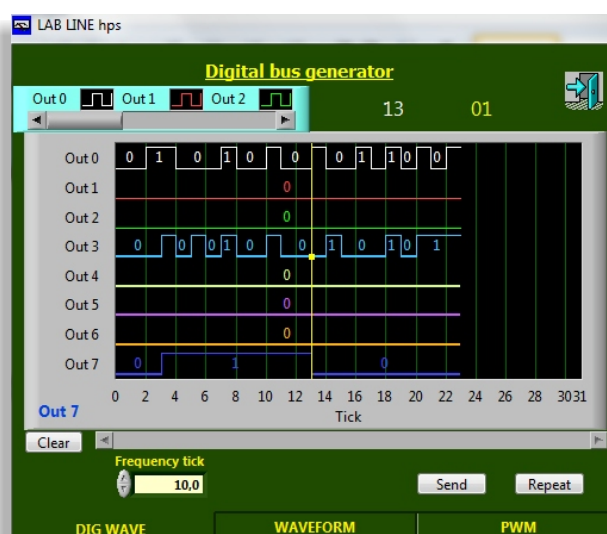
System requirement: Windows
XP / Vista / Win7-32/64 bit

Interface: USB 1.1 or higher

Software CD: 1620.1 EVGB



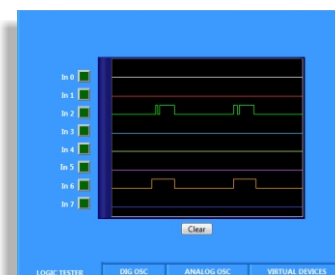
DIG WAVE (Digital Bus Generator)



Generation of bit pattern: Outputs: Digital out 0 - 7

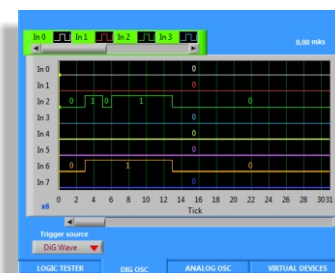
LOGIC TESTER

Inputs:
Digital in 0 - 7

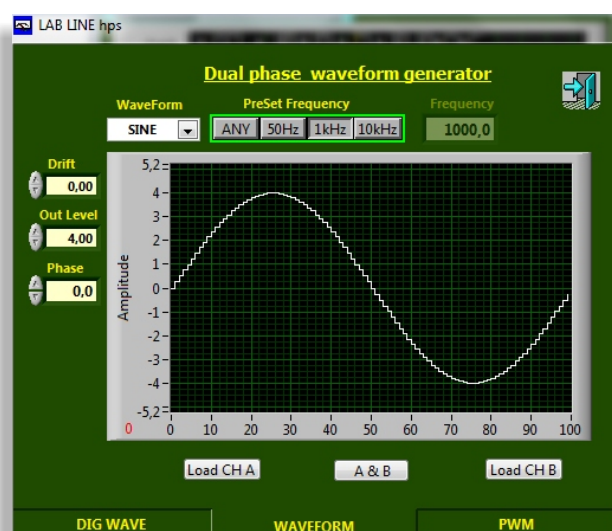


DIG OSC (Digital Oscilloscope)

Inputs:
Digital in 0 - 7

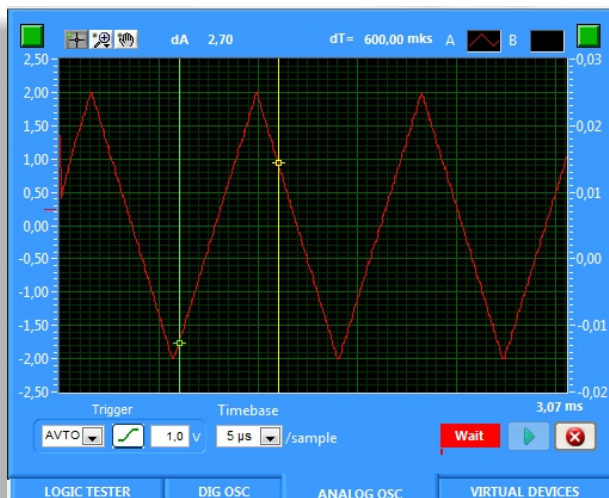


DUAL PHASE WAVEFORM GENERATOR



- Sine generator
- Triangle generator
- Saw tooth
- Square generator
- DC generator
- ANY (any signal is possible)
- Voltage adjustable +/- 5 V
- Frequency adjustable 0 ... 10 kHz
- Frequency 50 Hz, 1 kHz, 10 kHz
- DC offset +/- 5 V
- Phase 0 ... 360°

ANALOGUE OSC

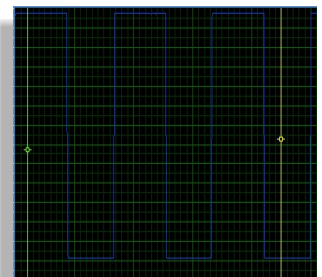
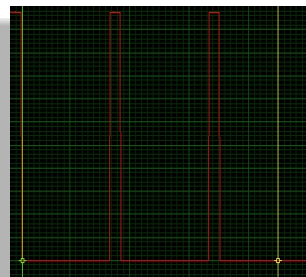


- Two channel oscilloscope
- Input voltage max. 0...10 V
- Frequency approx. 10 kHz
- Trigger Auto, Ch-A and Ch-B, pos. / neg.
- Variable time base 5 µs ... 5 ms / sample
- Autoscale function
- Zoom function
- Cursor, to read the values directly
- Colours and parameters of the display are adjustable

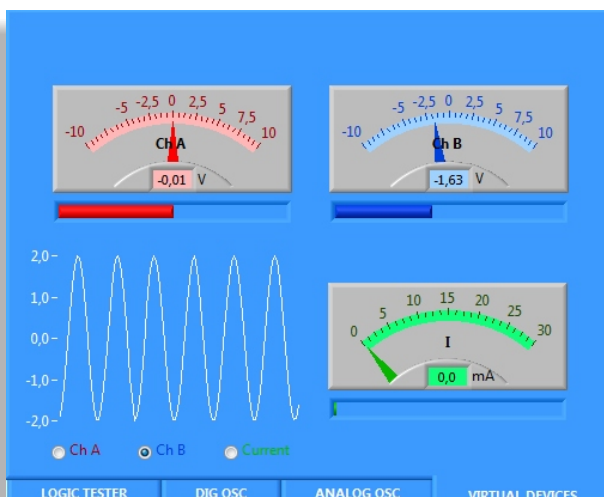
PWM WAVEFORM GENERATOR



- PWM Generator
- Frequency 0 ... 100 kHz, 0 ... 5 V
- Pulse width 0 ... 100% adjustable



VIRTUAL DEVICES



- Analogue display for Ch-A and Ch-B
- Free scalable, with value and beam display
- Writing function
- Analogue display for the current input
- Free scalable, with value and beam display



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Lehr- + Lernmittel GmbH
Altdorfer Straße 16
88276 Berg (Germany)

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Fax: 07 51 / 5 60 75 77
Web: www.hps-systemtechnik.com
E-Mail: export@hps-systemtechnik.com



RCLwin

Alternating current technology in a compact representation

(Type 001010)

With RCLwin you can ...

- ... calculate elementary alternating current circuits quickly and easily with a PC.
- ... display the frequency and phase response as a diagram.
- ... view voltage, current and apparent power in a diagram.
- ... display the vector diagram corresponding to the respective circuit
- re-dimension circuits.

Subjects:

- Single components
- Series circuits
- Parallel circuits
- Filters
- Resonance circuits
- Compensation

System Requirements:

- PC with Windows® Software
- Hard disk: 2 MB free
- Working memory: 4 MB
- 3.5" disk drive
- SVGA graphic card (800 x 600)

*All the
important
information
at a glance*

