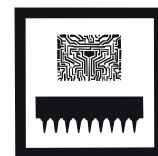

Digital Technology



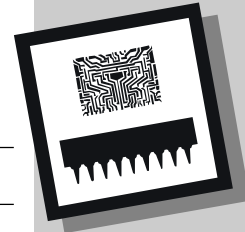
Digital Technology / Microcomputer Technology

3910	DIGI Board 2
3920	DIGI IC Board
3700	Series Demonstration Boards
9400	Series Module System
3530	IC Board
5132	Stepping Board
1602	LAB Line DIGI Lab
1620.1	LAB Line USB Measuring Interface
3850	Micro Controller Board
3851	PIC Controller Board
3891	PC Control Board PCI
3911	Converter Board 5 V / 24 V

Software

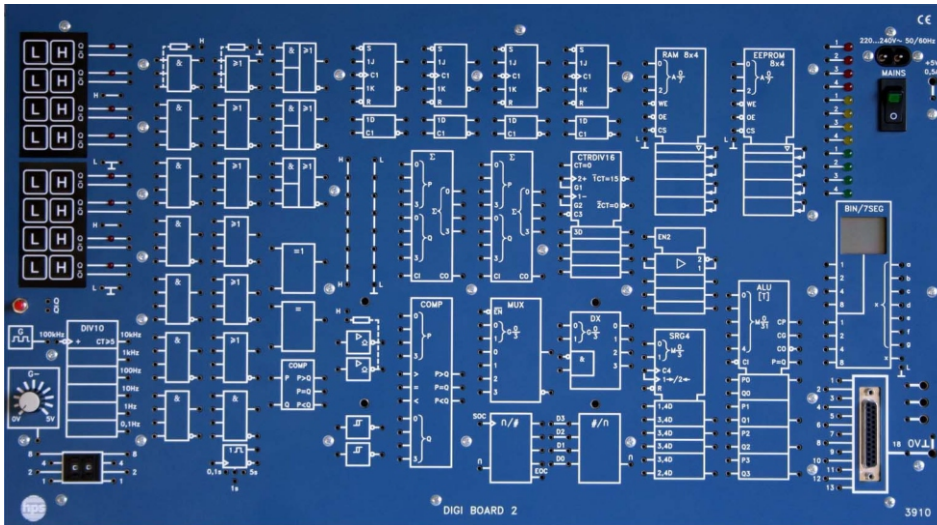
002027	8051win
002035	DIGIwin

Digital Technology / Microcomputer Technology



DIGI BOARD 2

Type 3910



DIGI BOARD 2 (Type 3910)

- Universal training and exercise unit for fundamental digital technology/ microcomputer technology
- The DIGI BOARD 2 contains all function groups and the power supply for fast experiment setup
- Can be used as a desktop, demonstration or portable training unit
- Individual expansion possibilities
- With an adapter for connection to a computer

The DIGI BOARD 2 has been developed for the instruction and detailed study of fundamental digital technology, non-contact control engineering and microcomputer technology.

All the function groups required for conducting experiments in digital technology are integrated in the DIGI BOARD 2 and supplied with power by a built-in power supply unit.

The individual function groups are connected in 2 mm connection technique.

The DIGI BOARD 2 can be set up as a desktop unit for conducting experiments or suspended in a rack for demonstration purposes.

The DIGI BOARD 2 can be converted into a portable training unit by simply screwing it into a Box. All the experiments can be conducted directly in the Box. Dust-free storage and protection against transport damages are further advantages of the Box version.

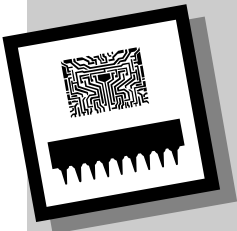
The experiment manual „Experiments in Digital Tech-

nology" (Type V 0160) is offered together with the DIGI BOARD 2.

This manual contains detailed experiment instructions with problems and solutions section.

Function Groups of the DIGI BOARD 2

- 2 input keyboards with 4 pairs of keys (L/H) each
- Clock generator with divider, TTL level, crystal-controlled
- DC signal source 0...5 V/ 10 mA
- Hexadecimal/dual coding switch (double)
- LED display, divided into 3 groups with the colours red, yellow, green
- HIGH/LOW, for tapping HIGH, LOW states
- 7-segment display (2-digit), with decoder: dual/7-segment
- Adapter (2 mm jacks/ SUB-D socket), for adapting 2 mm jacks to SUB-D connector (25-pin), pins 1...13 and 18 assigned
- 8 AND gates, with pull-up Resistors, one gate is disconnectable
- 6 OR gates, with pull-down Resistors, one gate is disconnectable
- 3 AND/OR combi-gates
- 1-bit comparator



DIGI BOARD 2

Type 3910

- 4-bit comparator
- 4 JK-flipflops, can also be used as RS flipflops
- 4 D-flipflops
- 2 adders (4-bit), with input and output carry
- Monoflop, settable times: 0.1 s; 1 s; 5 s
- Multiplexer, 4 channels
- Demultiplexer, 4 channels
- Shift register (4-bit), parallel and serial operation possible, bidirectional
- ALU, for conducting 16 arithmetic and 16 logical computing operations with 4-bit dual numbers
- Binary counter (4-bit), up/down counter
- 2 inverters with open collector (pull-up resistors can be connected)
- 2 Schmitt triggers, inverting
- Units complements for negating a 4-bit binary number
- Antivalence and equivalence gates
- RAM 8x4, static RAM, 8 addresses, 4 bits data width

- EEPROM 8x4, storage time without power supply approx. 1 hour
- AD / DA converter (4-bit)
- Two slots for expanding a circuit with additional plug-in modules

Recommended Accessories

- Experiment manual: „Experiments in Digital Technology“ (Type V 0160) with problems and solutions section for the following subjects:
 - Basic logical circuits
 - Schmitt triggers
 - Bistable flipflops
 - Monostable flipflops
 - Code converters, coders
 - Computing circuits
 - Counting circuits
 - Register circuits
 - Multiplex mode
 - ALU
 - Memory circuits
 - Analog-digital converter, digital-analog converter
- Set of Accessories (Type 3910.1), comprising 2 mm connecting leads (60 in all)

Digital Technology / Microcomputer Technology

Expansion Possibilities

The components listed below are used for setting up experiments above and beyond those described in the experiment manual „Experiments in Digital Technology“ (Type V 0160).

- IC BOARD (Type 3530)
- IC Socket, dual-in-line (Type 9156)
- IC Socket, 20-pin (Type 9156.2)
- IC Socket, 28-pin (Type 9156.3)
- Assembly kit comprising:
 - Empty Housings (Type 9152.7)
 - Universal PCB, with dot grid (Type 9167)
 - Universal PCB, with line grid (Type 9167.1)
 - Jacks (Type 9168), Stickers (Type 9162.5-6)

Technical Data

Mains connection

- Voltages (via LE connector): 230 V AC / 115 V (110 V) AC; 30 VA; 50 ... 60 Hz

Integrated power supply for additional plug-in modules

5 V DC/max. 1 A; the power is supplied via the plugs in the base of the modules.

DC voltage source +5 V / 0.5 A

For connecting external equipment

IC components

All IC components are inserted in sockets.

Mechanical design

The front panel of the DIGI BOARD 2 is made of 5 mm thick Laminate, matt blue in colour with white engraving representing the built-in function groups.

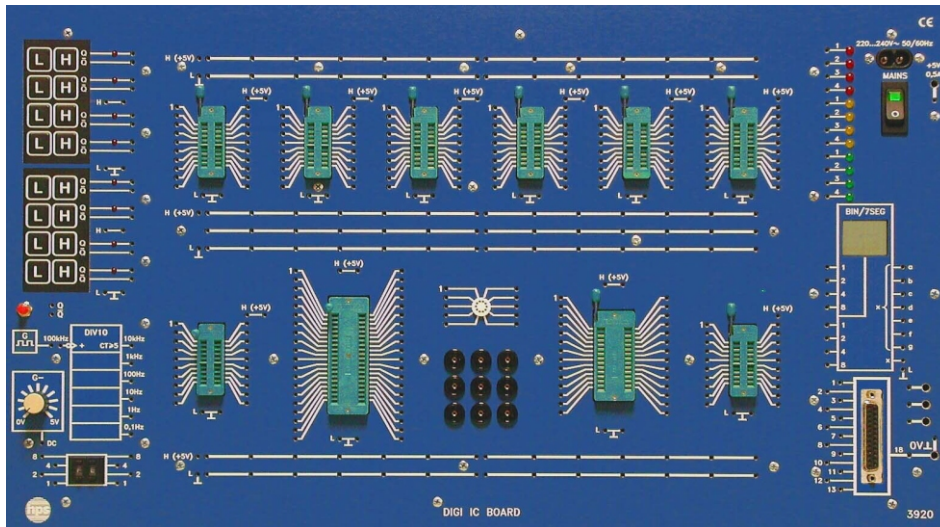
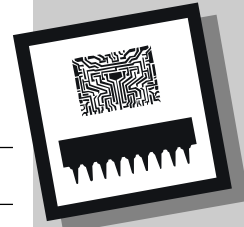
The rear of the DIGI BOARD 2 is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

Dimensions and weights

- Board version, Type 3910: 532 x 297 x 95 mm (w x h x d); weight: 3.5 kg
- Box version, Type 3910 and Type 3910.20: 580 x 450 x 155 mm; weight: 7.5 kg

Subject to technical modifications.

Digital Technology / Microcomputer Technology



DIGI IC BOARD

Type 3920

DIGI IC BOARD (Type 3920)

- Universal exercise unit for assembling circuits with commercial IC components
- Fast experiment setup without soldering
- Contains all input and output units and power supply for fast experiment setup
- All DIL-IC sockets with quick-action clamp
- Combinable with external equipment

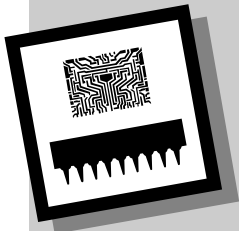
With the DIGI IC BOARD hps SystemTechnik offers a universal device ideally suitable for setting up experiments with commercial components in the fields of

- **digital technology** and
- **microprocessor Technology.**

Function groups of the DIGI IC BOARD

- **2 input keyboards**
with 4 pairs of keys each for generating and resetting high and low states. High states are indicated by red LEDs. When key „L“ is kept pressed and key „M“ is shortly pressed at the same time, „keying“ is allowed (not debounced in keying mode).
- **Pushbutton**
bounce-free, with the outputs Q and Q̄
- **Clock generator**
100 kHz, frequency divider can be connected
- **Frequency divider**
6-fold, with 10s division: 10 kHz, 1 kHz, 100 Hz, 10 Hz, 1 Hz, 0.1 Hz. The frequency divider can also be operated with an external clock generator.
- **Signal source**
e. g. for operating an A/D converter
- **26 jacks (2 mm)**
for tapping off high states. All jacks are connected directly to +5 V.

- **25 jacks (2 mm)**
for tapping off low states. All jacks are connected directly to ground (GND).
- **8 IC sockets (24-pin)**
for DIL-ICs with quick-action clamps
- **IC socket (28-pin)**
for DIL-ICs with quick-action clamps
- **IC socket (40-pin)**
for DIL-ICs with quick-action clamps
- **Round socket (10-pin)**
for ICs and transistors
- **9 branching points**
for setting up experiments with commercial components such as LEDs, resistors and capacitors
- **Coding switch**
2-digit hexadecimal/dual coding switch with push-buttons for counting up (+) and down (-). The outputs are designated 1, 2, 4 and 8 according to their valence.
- **LED display**
12-fold LED display with driver, divided into three groups with the colours red, yellow and green



DIGI IC BOARD

Type 3920

- **7-segment display**
2-digit 7-segment display with dual/7-segment decoder. Two 4-bit binary numbers can be entered through inputs 1, 2, 4 and 8 and displayed in hexadecimal form.
- **Adapter**
for adapting 2 mm connections to 25-pin SUB-D connector (e. g. connection of a PC)
- **4 adapter fields**
for adapting 4 mm to 2 mm connections
- **14 jack rows**
2 mm jacks for supplying the ICs used with high and low states. Furthermore these jack rows can be used as distributors for assembled circuits and as through-connection to other units.
- **2 DC voltage sources**
for internal power supply and for connecting external units, e. g. UNIVERSAL BOARD 1 (Type 8175) and UNIVERSAL BOARD 2 (Type 8176)

All IC sockets and function groups are wired to 2 mm connecting leads and plugs.

To conduct the experiments, the DIGI IC BOARD is placed on a table or suspended in an hps rack for demonstration purposes. The DIGI IC BOARD can be converted into a portable training unit by simply screwing it into a Box: All the experiments can be conducted directly in this Box. Dust-free storage and protection against transport damages are further advantages of the Box version.

Accessories Recommended

- Set of Accessories (Type 3920.1), consisting of 2 mm connecting leads (120 pcs.)
- Box for DIGI IC BOARD (Type 3920.20)
- Set of ICs (Type 3920.5)

Expansion possibilities

- UNIVERSAL BOARD 1 (Type 8175)
- UNIVERSAL BOARD 2 (Type 8176)
- Module System for Digital Technology (Series 9400)

Technical data

Mains connection

- 220 V AC ... 240 V AC / 115 V AC (110 V AC); ca. 30 VA; 50 ... 60 Hz

Signal source

- Output voltage and current: approx. 0 ... 5 V DC / 10 mA, short-circuit-proof

DC voltage source for internal power supply

- Output voltage and current: +5 V / 3 A, short-circuit-proof, also for power supply of the plugged IC components

DC voltage source for external units

- Output voltage and current: +5 V / 0,5 A, short-circuit-proof

Clock generator

- Frequency: 100 kHz

Frequency divider

- Frequencies: 10 kHz, 1 kHz, 100 Hz, 10 Hz, 1 Hz, 0.1 Hz

TTL level

- At all high and low jacks and on the clock generator, frequency divider, 7-segment display, coding switch, pushbutton, input keyboard and LED displays

Mechanical data

The front panel of the DIGI IC BOARD is made of 5 mm thick Laminate, matt blue in 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 3920): 532 x 297 x 110 mm (w x h x d); weight: approx. 3.5 kg
- Box version (Type 3920 and Type 3920.20): 580 x 450 x 155 mm; weight: approx. 7 kg

Subject to technical modification.

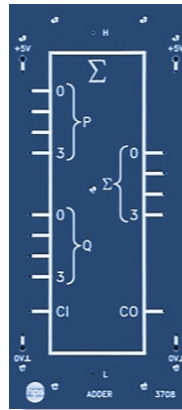
Digital Technology / Microcomputer Technology



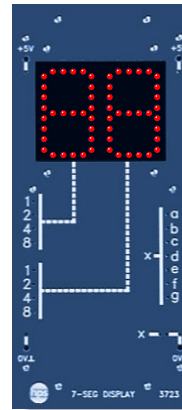
Input
Keyboard



Hexadecimal
Switch



Adder



7-Segment
Display

- Universal demonstration system for the fundamentals of digital and microcomputer technology
- Displays and input units with a large and clear layout
- Same technical basic conception as with the training systems (DIGI BOARD 2 and Module System)
- Detailed test evaluations for the entire field of digital technology
- Operating voltage inputs protected against overvoltage and reversed polarity

With the Demonstration Boards, hps SystemTechnik offers an extensive program for the following fields:

- Digital technology
- Microcomputer technology
- Data systems technology
- Digital control engineering
- Industrial electronics
- Hybrid technology

The system is designed to perform simple logical operations as well as to set up sophisticated digital circuits.

The front panels of the Demonstration Boards are marked with symbols of the respective function group.

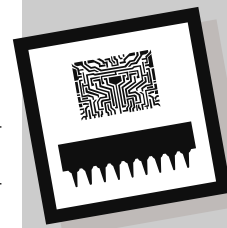
Connection is assured with connecting leads and plugs via 2 mm jacks.

The operating voltage of 5 V is supplied to the Boards via 4 mm or 2 mm jacks through an external power supply unit.

To conduct the experiments, the Demonstration Boards can be directly placed on a table or suspended in a rack for demonstration purposes.

The Demonstration Boards for Digital Technology are fully compatible with other hps digital systems, like the DIGI BOARD 2 and the Module System for Digital Technology.

The experiments contained in the experiment manual „Experiments in Digital Technology“ (Type V 0160) can be conducted with all digital systems from hps.



Demonstration Boards

Series 3700

Particular Features

All Demonstration Boards are protected against reverse polarity and overvoltage (max. 30 V DC).

7-Segment Display

(Type 3723):

display height: 65 mm

To reduce the current consumption with keeping the same brightness, the LEDs are pulsed.

Input Keyboard

(Type 3702):

provided with large keys, 30 mm x 30 mm

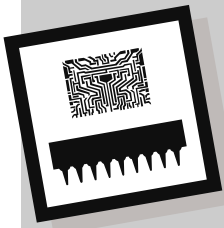
Hexadecimal Switch

(Type 3704):

provided with large hexadecimal coding switches and additional 7-segment displays (25 mm high)

LED Display (Type 3720):

provided with 10 mm LEDs

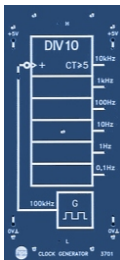


Demonstration Boards

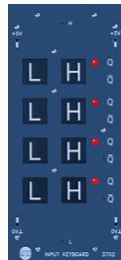
Series 3700

Digital Technology / Microcomputer Technology

Demonstration Boards for Digital Technology



Type 3701



Type 3702

Clock Generator

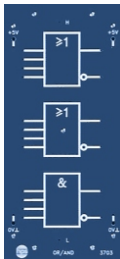
Type 3701

Squarewave signal (TTL level), with series-connected frequency divider; the divider can also be used separately; frequencies: 0.1 Hz, 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz; current consumption: 110 mA

Input Keyboard

Type 3702

Four pairs of keys (L/H), for generating LOW and HIGH states, HIGH state indicated by LED; current consumption: 10 ... 50 mA



Type 3703



Type 3704

OR / AND

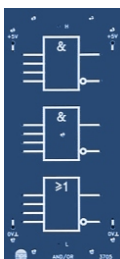
Type 3703

The Board contains two OR gates and one AND gate each with four inputs and two outputs, one of which is inverted; current consumption: 10 ... 20 mA

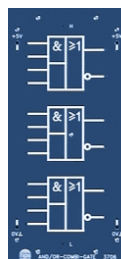
Hexadecimal Switch, Pushbutton Switch, Signal Source

Type 3704

One hexadecimal/dual coding switch (2-digit); one pushbutton switch and one signal source (0 ... 5 V DC/10 mA); display is done through 7-segment displays (display height: 25 mm); current consumption: 130 ... 200 mA



Type 3705



Type 3706

AND / OR

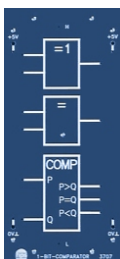
Type 3705

The Board contains two AND gates and one OR gate each with four inputs and two outputs, one of which is inverted; current consumption: 10 ... 20 mA

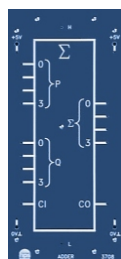
AND / OR Combi Gate

Type 3706

The Board contains three AND/OR combi gates (AND gates with two inputs each and OR gates with two outputs each, one of which is inverted); current consumption: 20 ... 30 mA



Type 3707



Type 3708

1-Bit Comparator, Antivalence, Equivalence

Type 3707

The Board contains one antivalence gate; one equivalence gate and one comparator (1 bit); current consumption: 25 ... 35 mA

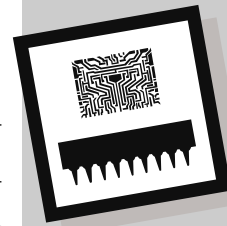
Adder

Type 3708

4-bit full adder with input and output carry, for addition of two 4-bit dual numbers; current consumption: 50 ... 65 mA

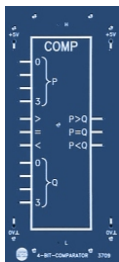
Digital Technology / Microcomputer Technology

Demonstration Boards for Digital Technology

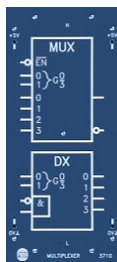


Demonstration Boards

Series 3700



Type 3709



Type 3710

4-Bit Comparator

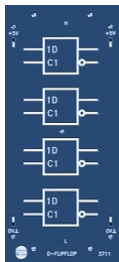
Type 3709

For comparing two 4-bit dual numbers, with cascading inputs;
current consumption: 8 ... 15 mA

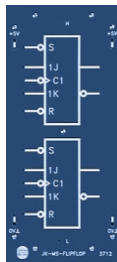
Multiplexer, Demultiplexer

Type 3710

Multiplexer: four channels, with additional inverted output;
demultiplexer: four channels; two inputs, one of which is inverted;
current consumption: 30 ... 50 mA



Type 3711



Type 3712

D-Flipflop

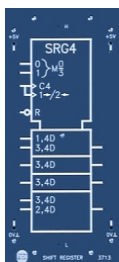
Type 3711

The Board contains four D-flipflops with two outputs each, one of which is inverted;
current consumption: 15 ... 25 mA

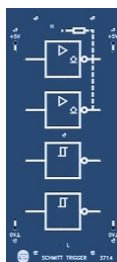
JK-Flipflop

Type 3712

The Board contains two JK-flipflops, which can also be used as RS-flipflops;
current consumption: 30 ... 40 mA



Type 3713



Type 3714

Shift Register

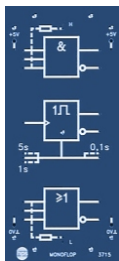
Type 3713

4 bits, bidirectional, parallel and serial operation possible;
current consumption: 15 ... 25 mA

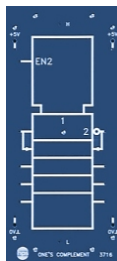
Schmitt Trigger, Inverter

Type 3714

The Board contains two inverting Schmitt triggers and two inverters with open collector (pull-up resistors connectable);
current consumption: 30 ... 50 mA



Type 3715



Type 3716

Monoflop, AND / OR

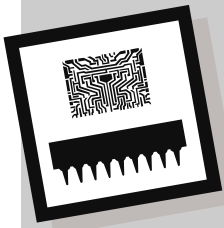
Type 3715

The Board contains one monoflop (settable times: 0.1 s, 1 s, 5 s), one AND gate and one OR gate with connectable pull-up and pull-down resistors; current consumption: 25 ... 30 mA

One's Complement

Type 3716

For inverting a 4-bit binary number;
current consumption: 10 ... 20 mA

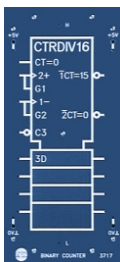


Demonstration Boards

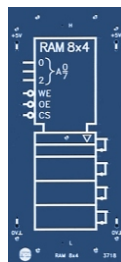
Series 3700

Digital Technology / Microcomputer Technology

Demonstration Boards for Digital Technology



Type 3717



Type 3718

Binary Counter

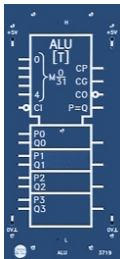
Type 3717

The Board contains one binary up/down counter, synchronous, 4 bits;
current consumption: 20 ... 40 mA

RAM 8 x 4

Type 3718

Static RAM, eight addresses (0 ... 7), 4-bit data width;
current consumption: 10 ... 30 mA



Type 3719



Type 3720

ALU

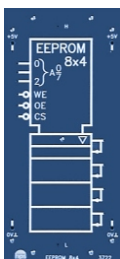
Type 3719

For conducting 16 arithmetic and 16 logical computing operations with two dual numbers (4 bits);
current consumption: 5 ... 30 mA

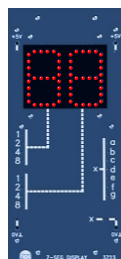
LED Display

Type 3720

12 LEDs (10 mm), divided into 3 groups with the colours red, yellow and green;
current consumption: 10 ... 300 mA



Type 3722



Type 3723

EEPROM 8 x 4

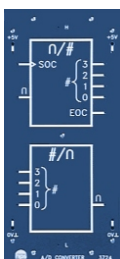
Type 3722

8x4 bits; storage time without power supply: approx. 1 hour;
current consumption: 10 ... 30 mA

7-Segment Display

Type 3723

2-digit, 7-segment display (display height: 65 mm), with dual/7-segment decoder, one digit can be switched for individual segment display; current consumption: 250 ... 300 mA



Type 3724

AD Converter, DA Converter

Type 3724

The Board contains one AD converter and one DA converter (4 bits);
current consumption: 20 ... 50 mA

Digital Technology / Microcomputer Technology

General Technical Data

- Dimensions of the Demonstration Boards: 133 x 297 mm (w x h); depth: 90 ... 100 mm
- Weight: approx. 0.6 ... 0.7 kg
- The front panel of the Boards is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups. The rear of the Boards is protected with a grey plastic cover. Its shape allows the Boards to be placed at an ergonomically favourable angle for example on a table.
- Operating voltage:
5 V DC, over external power supply unit (e. g. 5 V SUPPLY BOARD, Type 1002.3)
The operating voltage inputs are protected against overvoltage and reversed polarity (max. 30 V DC).

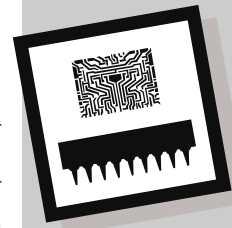
Recommended Accessories

- Experiment manual:
„Experiments in Digital Technology“ (Type V 0160), with problems and solutions for the following subjects:
- Basic logical circuits
- Schmitt trigger
- Bistable / monostable multivibrators
- Code converters, coders
- Arithmetic circuits
- Counting circuits
- Register circuits
- Multiplex operation
- Arithmetic Logic Unit (ALU)
- Memory components
- Analog-digital converter, digital-analog converter
- Bench Rack (Type 8112)
- Set of Accessories (Type 3700.1)
consisting of connecting leads (2 mm) and connecting plugs (4 mm)

Expansion Possibilities

- IC BOARD (Type 3530)

Subject to technical modifications.

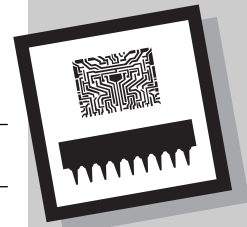


**Demonstration
Boards**

Series 3700

Digital Technology / Microcomputer Technology

- Modular training system for the fundamentals of digital technology / microcomputer technology
- Clear experiment assembly because only the modules required for the experiment need to be plugged in
- Individual expansion possibilities
- Detailed experiment descriptions

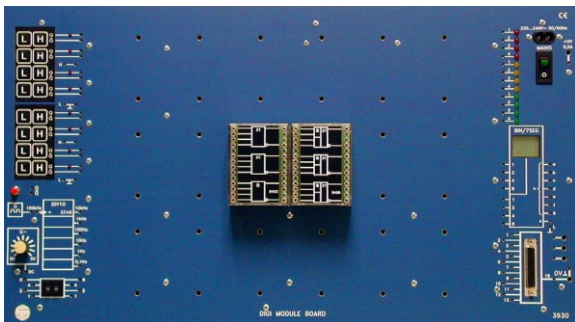


**Digital
Technology**

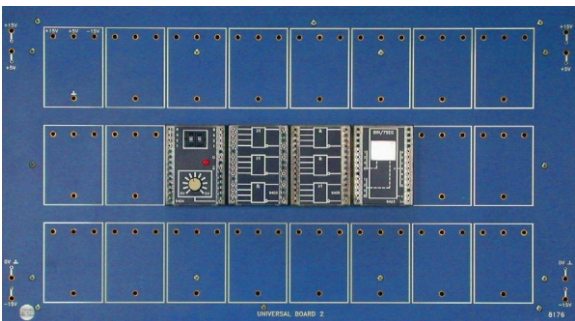
Module System

Series 9400

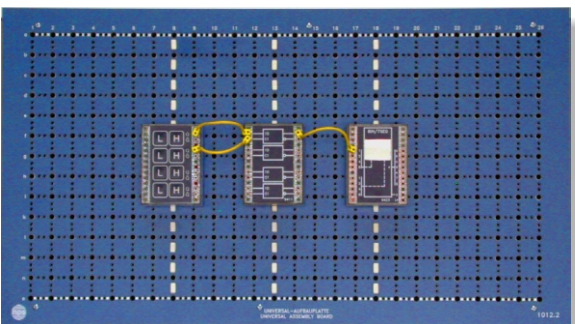
Assembly possibilities for the Module System Digital Technology



Experiment assembly with the Module System for Digital Technology and the DIGI MODULE BOARD (Type 3930)



Experiment assembly with the Module System for Digital Technology and the UNIVERSAL BOARD 2 (Type 8176)



Experiment assembly with the Module System for Digital Technology and the Universal Assembly Board (Type 1012.2)

DIGI MODULE BOARD

- Power supply, input and output units contained in the DIGI MODULE BOARD; this means shorter experiment setup times
- Clear storage of all modules on a separate imprinted storage board

The Module System for Digital Technology has been designed for basic and further training in the fundamentals of digital technology, non-contact control engineering and microcomputer technology.

It consists of digital modules which are plugged into boards or assembly boards to conduct experiments, for example:

UNIVERSAL BOARD

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

- DIGI MODULE BOARD (Type 3930)

- UNIVERSAL BOARD 1 (Type 8175)

- UNIVERSAL BOARD 2 (Type 8176)

- Universal Assembly Board (Type 1012.1)

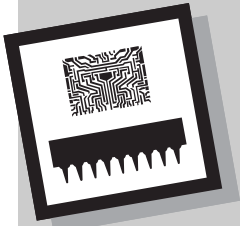
- Universal Assembly Board (Type 1012.2)

(see illustrations)

Universal Assembly Board

- Suitable for digital technology and basic electronic circuits
- Any power supply units can be used
- Available in two sizes

The experiment manual „Experiments in Digital Technology“ (Type V 0160) is offered in accompaniment of the Module System for Digital Technology. It contains detailed problem and solution sections



Digital Technology

Module System

Series 9400

hps SystemTechnik offers 25 modules for conducting experiments in digital technology and microcomputer technology.

These are illustrated below with designation, technical data and type number.

Digital Technology / Microcomputer Technology

Modules for Digital Technology

Technical Data of the Digital Modules (Types 9401 ... 9425)

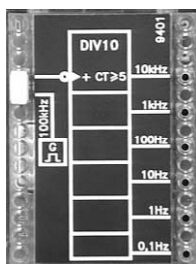
Mechanical construction

The module housings consist of a top section made of unbreakable transparent plastic and a sturdy bottom section made of black, glass-fibre reinforced plastic. The top and bottom sections are held together by two snap-action catches; these enable the housing to be opened quickly and easily.

There are two gold-plated laminated plugs in the base of the housing to plug the modules into the boards or assembly boards. The power supply is fed to the modules through these plugs also. The circuit symbol of the function group contained in the module is printed in white on the front.

Other technical data

- Plug diameter: 4 mm
- Plug spacing: 57 mm
- Operating voltage / current: +5 V DC / 0 ... max. 0.2 A
- All modules with reverse polarity protection
- All IC components inserted in sockets
- Housing dimensions: 75 x 56 x 35 mm (w x d x h)
- Weight: approx. 0.1 kg



Type 9401



Type 9402

Clock Generator

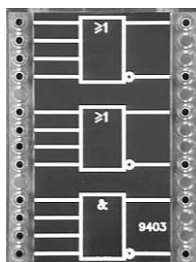
Type 9401

Squarewave voltage (TTL level); with series-connected divider; the divider can also be used separately; frequencies: 0.1 Hz; 1 Hz; 10 Hz; 100 Hz; 1 kHz; 10 kHz; 100 kHz; current consumption: 110 mA

Input Keyboard

Type 9402

Four pairs of keys (L/H); for generating LOW and HIGH states; HIGH state indicated by LED; current consumption: 10 ... 50 mA



Type 9403



Type 9404

OR Gate, AND Gate

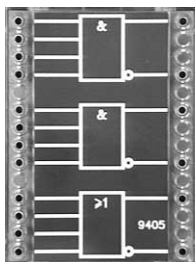
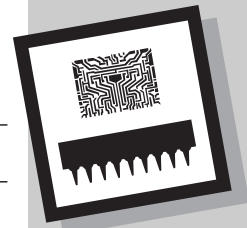
Type 9403

The module contains two OR gates and one AND gate each with four inputs and two outputs, one of which is negated; current consumption: 10 ... 20 mA

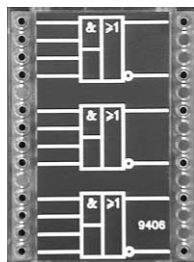
Hexadecimal / Dual Coding Switch, Pushbutton Switch, Signal Source

Type 9404

Contains one hexadecimal / dual coding switch (2-digit); one pushbutton switch and one signal source (0 ... 5 V DC); current consumption: 7 ... 50 mA



Type 9405



Type 9406

AND Gate, OR Gate

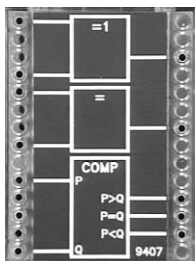
Type 9405

The module contains two AND gates and one OR gate each with four inputs and two outputs, one of which is negated;
current consumption: 10 ... 20 mA

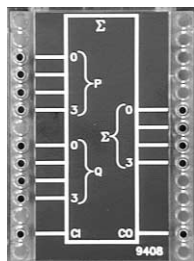
AND / OR Combi-Gate

Type 9406

The module contains three AND / OR combi-gates; AND gates with two inputs each and OR gates with two outputs each, one of which is negated;
current consumption: 20 ... 30 mA



Type 9407



Type 9408

Antivalence, Equivalence Gate, 1-Bit Comparator

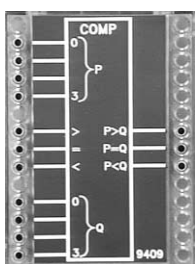
Type 9407

The module contains one antivalence gate; one equivalence gate and one comparator (1 bit);
current consumption: 25 ... 35 mA

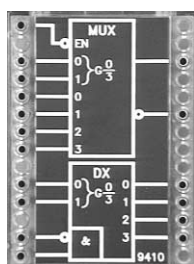
Adder

Type 9408

4-bit full adder; with input and output carry; for addition of two 4-bit dual numbers;
current consumption: 50 ... 65 mA



Type 9409



Type 9410

4-Bit Comparator

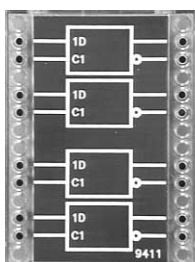
Type 9409

For comparing two 4-bit dual numbers, with cascading inputs;
current consumption: 8 ... 15 mA

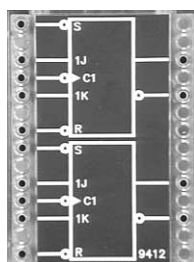
Multiplexer, Demultiplexer

Type 9410

Multiplexer: four channels; with additional negated output;
demultiplexer: four channels; two inputs, one of which is negated;
current consumption: 30 ... 50 mA



Type 9411



Type 9412

D-Flipflop

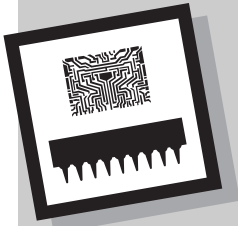
Type 9411

The module contains four D-flipflops with two outputs each, one of which is negated;
current consumption: 15 ... 25 mA

JK-Flipflop

Type 9412

The module contains two JK-flipflops, which can also be used as RS-flipflops;
current consumption: 30 ... 40 mA



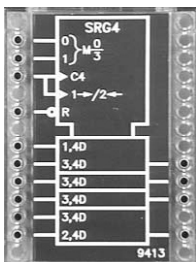
Digital
Technology

Module System

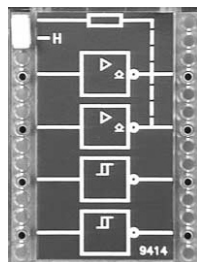
Series 9400

Digital Technology / Microcomputer Technology

Modules for Digital Technology



Type 9413



Type 9414

Shift Register

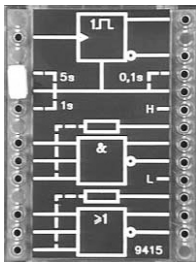
Type 9413

4 bits; bidirectional; parallel and serial operation possible;
current consumption: 15 ... 25 mA

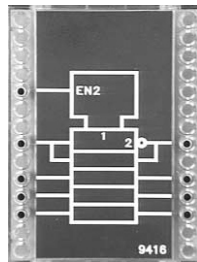
Inverter, Schmitt Trigger

Type 9414

The module contains two inverters with open collector (pull-up resistors switchable) and two inverting Schmitt triggers;
current consumption: 30 ... 50 mA



Type 9415



Type 9416

Monoflop, AND Gate, OR Gate

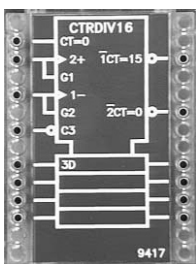
Type 9415

The module contains one monoflop (settable times: 0.1 s; 1 s; 5 s), one AND gate and one OR gate with connectable pull-up and pull-down resistors;
current consumption: 25 ... 30 mA

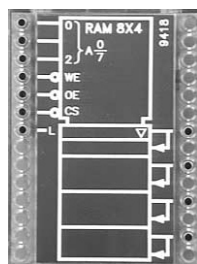
One's Complement

Type 9416

For negating a 4-bit binary number;
current consumption: 10 ... 20 mA



Type 9417



Type 9418

Binary Counter

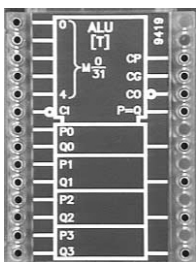
Type 9417

The module contains one binary up / down counter, synchronous; 4 bits;
current consumption: 20 ... 40 mA

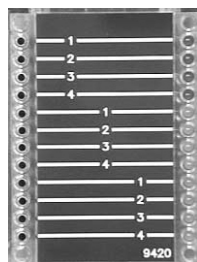
RAM 8 x 4

Type 9418

Static RAM; eight addresses (0 ... 7); 4-bit data width;
current consumption: 10 ... 30 mA



Type 9419



Type 9420

ALU

Type 9419

For conducting 16 arithmetic and 16 logical computing operations with two dual numbers (4 bits);
current consumption: 5 ... 30 mA

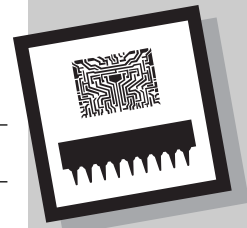
LED Display (with driver)

Type 9420

12 LEDs, divided into 3 groups with the colours red, yellow and green;
current consumption: 10 ... 200 mA

Digital Technology / Microcomputer Technology

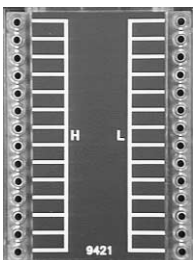
Modules for Digital Technology



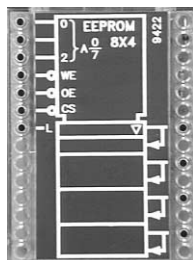
Digital
Technology

Module System

Series 9400



Type 9421



Type 9422

HIGH / LOW

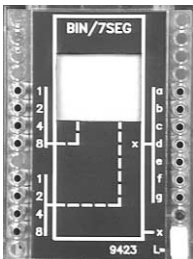
Type 9421

For tapping HIGH and LOW states;
the HIGH outputs are short-circuit-proof;
current consumption: 10 ... 60 mA

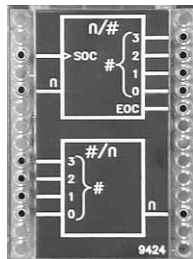
EEPROM

Type 9422

8 x 4 bits; storage time without power supply: approx. 1 hour;
current consumption: 10 ... 30 mA



Type 9423



Type 9424

7-Segment Display (2-digit)

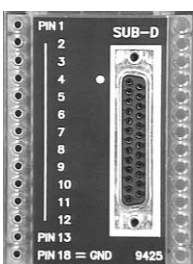
Type 9423

With decoder: dual / 7-segment; one digit can be switched for
individual segment display
current consumption: 90 mA

AD Converter, DA Converter

Type 9424

The module contains one AD converter and one
DA converter (4 bits);
current consumption: 20 ... 50 mA

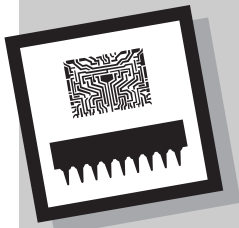


Type 9425

Adapter (2 mm jacks / SUB-D socket)

Type 9425

For connection to a computer



Digital Technology

Module System

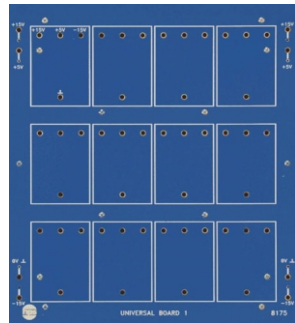
Series 9400

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

Digital Technology / Microcomputer Technology

UNIVERSAL BOARD 1 / UNIVERSAL BOARD 2



UNIVERSAL BOARD 1
(Type 8175)

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

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 printing

Plug-in locations

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

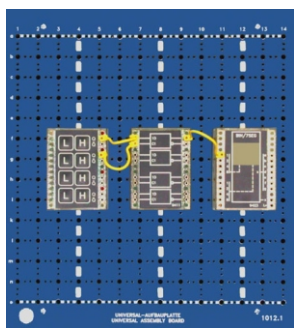
Dimensions/weight

- 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

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.

Universal Assembly Boards



Universal Assembly Board
(Type 1012.1)

The Universal Assembly Board is available in two sizes and can be used both for experiment assembly

with plug-in components and for digital technology in connection with the Digital Modules.

It is equipped with 2 mm and 4 mm jacks and therefore allows a flexible assembly with respect to the arrangement of the Digital Modules and the operating voltage supply.

Signals are connected to the Digital Modules by 2 mm leads and the operating voltage is supplied through 2 mm plugs.

Technical Data

Operating voltage supply for the Digital Modules

+5 V DC, by external power supply units

Front panel

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

Jacks

- 2 mm and 4 mm
- Arrangement of the 4 mm jacks in 19 mm grid

Dimensions/weight

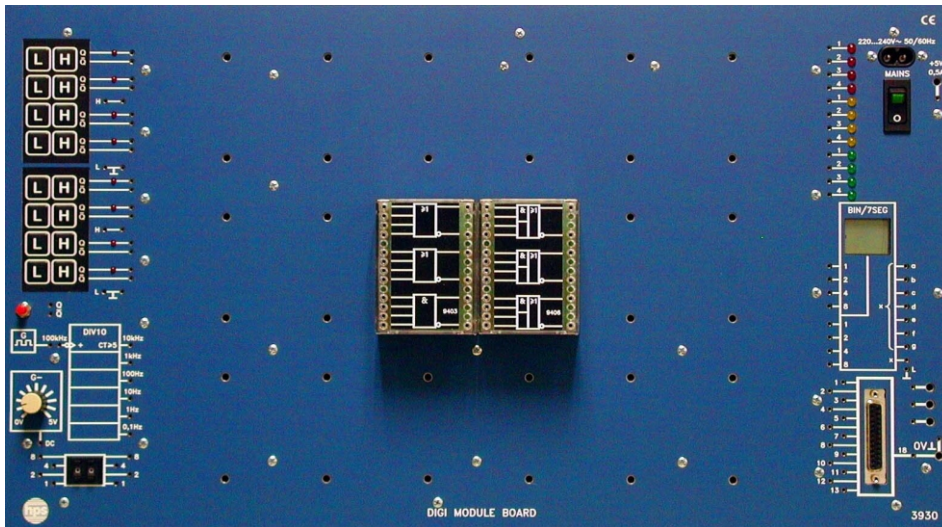
- Universal Assembly Board (Type 1012.1):
266 x 297 x 90 mm (w x h x d) / 1.25 kg
- Universal Assembly Board (Type 1012.2):
532 x 297 x 90 mm (w x h x d) / 2.4 kg

A sturdy plastic cover protects the back of the Board. Its shape allows the Board to

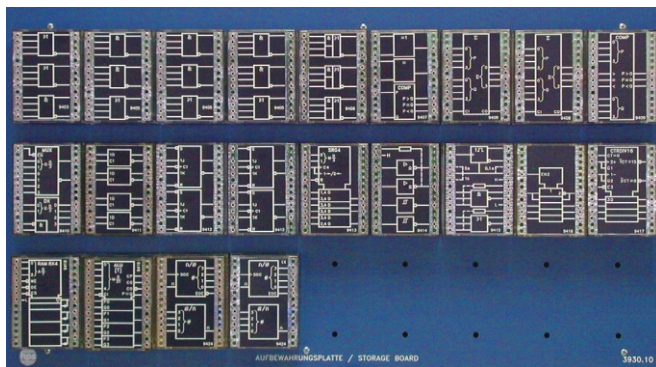
be placed at an ergonomically favourable angle e. g. on a table.

Digital Technology / Microcomputer Technology

DIGI MODULE BOARD (Type 3930)



DIGI MODULE BOARD (Type 3930)



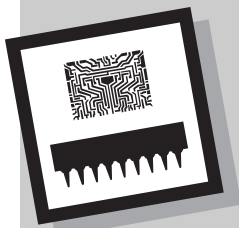
Storage Board for digital modules
(Type 3930.10)

The input and output units typical in digital technology are integrated in the DIGI MODULE BOARD. This greatly reduces the experiment setup times. A built-in power supply unit provides the voltage supply

for the input and output units and the plugged modules.

The plugged modules are powered directly through the plugs in the base; the modules have a built-in reverse polarity protection.

The plugged modules and the input and output units are connected by 2 mm leads.



Digital
Technology

Module System

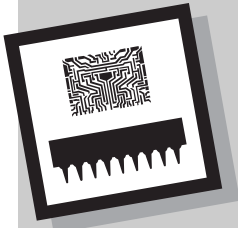
Series 9400

The DIGI MODULE BOARD is placed on a bench for conducting experiments or suspended in a rack for demonstration purposes.

hps SystemTechnik offers the Storage Board Type 3930.10 with the DIGI MODULE BOARD for storing the digital modules required for conducting the experiments as described in the experiment manual „Experiments in Digital Technology“ (Type V 0160).

Mechanical construction

The front panel of the DIGI MODULE BOARD and the Storage Board are made of 5 mm thick laminate, matt



Digital Technology

Module System

Series 9400

blue in colour with white printing representing the built-in function groups.

The rear of the Boards is protected with a grey plastic cover.

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

The DIGI MODULE BOARD and the Storage Board can be converted into a portable training unit by simply screwing both into a Box: All the experiments can be conducted directly in the Box. Dust-free storage and protection against transport damages are further advantages of the Box version.

Digital Technology / Microcomputer Technology

Technical Data of the DIGI MODULE BOARD (Type 3930)

Mains connection

- Voltage (by LE connector):
230 V AC/115 V (110 V) AC; 30 VA; 50 ... 60 Hz

Power supply for modules

- 5 V DC/max. 2 A; short-circuit-proof

Connector panel – DIGI MODULE BOARD

- 18 locations for modules (4 mm jacks); the power is supplied to the modules through the 4 mm jacks.

DC voltage signal source (0 ... 5 V DC / 10 mA)

Continuously adjustable with potentiometer; short-circuit-proof

DC voltage source (+5 V DC / 0.5 A)

Fixed voltage; short-circuit-proof; for external units

Input keyboard

- 2 input keyboards with 4 pairs of keys each (L / H) for generating LOW and HIGH states; HIGH state displayed by LED

Clock generator (crystal-controlled, 100 kHz)

- Squarewave signal (TTL level); with series-connectable divider; the divider can also be used separately.
- Frequencies: 0.1 Hz; 1 Hz; 10 Hz; 100 Hz; 1 kHz; 10 kHz; 100 kHz

Hexadecimal / dual coding switch (2-fold)

The hexadecimal number adjustable by keys is converted into a dual number.

LED display (with driver)

12 LEDs, divided into three groups with the colours red, yellow, green

7-segment display (2-digit)

With decoder: dual/7-segment; one digit can be switched for individual segment display

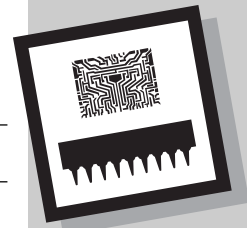
Adapter (2 mm jacks / SUB-D socket)

For adapting 2 mm jacks to SUB-D connector (25-pin); pins 1 ... 13 and 18 occupied

Dimensions and weights

- Board version (Type 3930): 532 x 297 x 90 mm (w x h x d); weight: 3.3 kg
- Box version, consisting of:
DIGI MODULE BOARD (Type 3930);
Storage Board (Type 3930.10) and Box (Type 3930.20):
580 x 450 x 200 mm; total weight: 10 kg
- Storage Board (Type 3930.10): 532 x 297 x 140 mm (w x h x d); weight: 3.7 kg (with plugged modules)

Digital Technology / Microcomputer Technology



Digital
Technology

Module System

Series 9400

Recommended Accessories

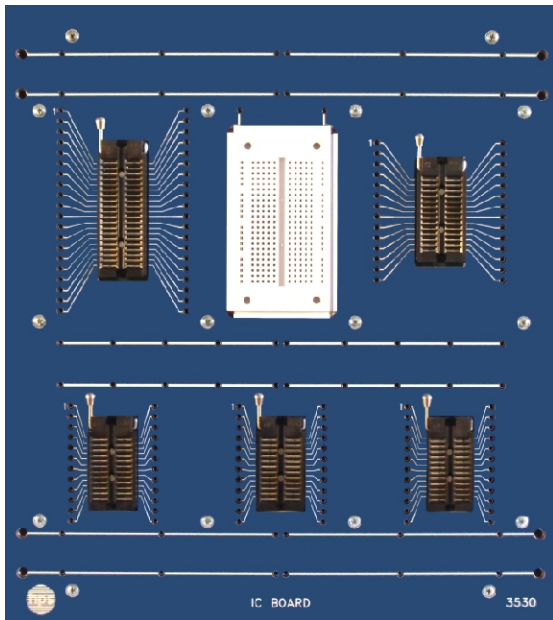
- Set of Accessories (Type 3910.1), consisting of 2 mm leads (60 in all)
- Experiment manual:
„Experiments in Digital Technology“ (Type V 0160)
with problems and solutions for the following subjects:
 - Basic logical circuits
 - Schmitt trigger
 - Bistable multivibrators
 - Monostable multivibrators
 - Code converters, coders
 - Arithmetic circuits
 - Counting circuits
 - Register circuits
 - Multiplex operation
 - Arithmetic Logic Unit (ALU)
 - Memory components
 - Analog-digital converter, digital-analog converter

Expansion Possibilities

Additional experiments not described in this leaflet can be conducted with the equipment and components listed below.

- IC BOARD (Type 3530)
- IC Socket, dual-in-line (Type 9156)
- IC Socket, 20-pin (Type 9156.2)
- IC Socket, 28-pin (Type 9156.3)
- Assembly kit comprising:
 - Empty Housings (Type 9152.7)
 - Universal PCB, with dot grid (Type 9167)
 - Universal PCB, with line grid (Type 9167.1)
 - Jacks (Type 9168)
 - Stickers (Type 9162.5-6)

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

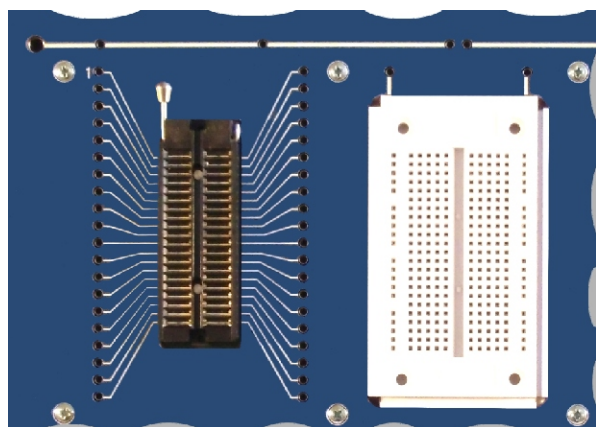
- Set of Accessories (Type 3530.1), consisting of connecting leads and plugs

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.

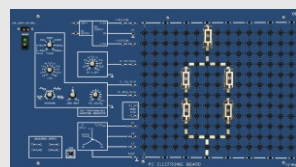
- Dimensions: 266 x 297 x 90 mm (w x h x d)
- Weight: approx. 1.25 kg



Bread Board

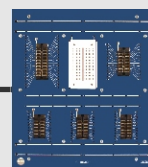
Fundamentals of Electronics / Analog and Digital Technology

Possible Combinations of the IC BOARD with Other hps Units



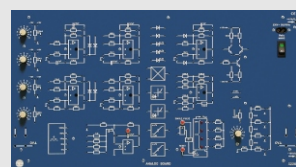
ELECTRONIC BOARD

Type 1018



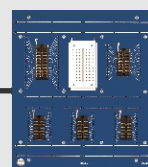
IC BOARD

Type 3530



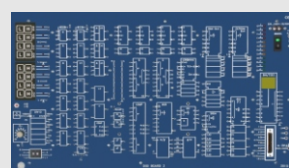
ANALOG BOARD

Type 3220



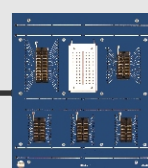
IC BOARD

Type 3530



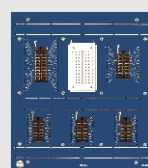
DIGI BOARD 2

Type 3910



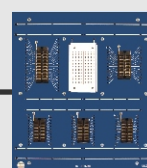
IC BOARD

Type 3530



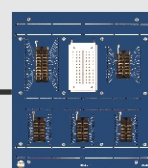
IC BOARD

Type 3530



IC BOARD

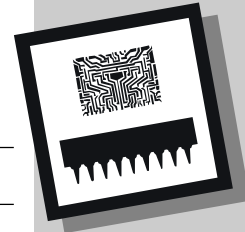
Type 3530



IC BOARD

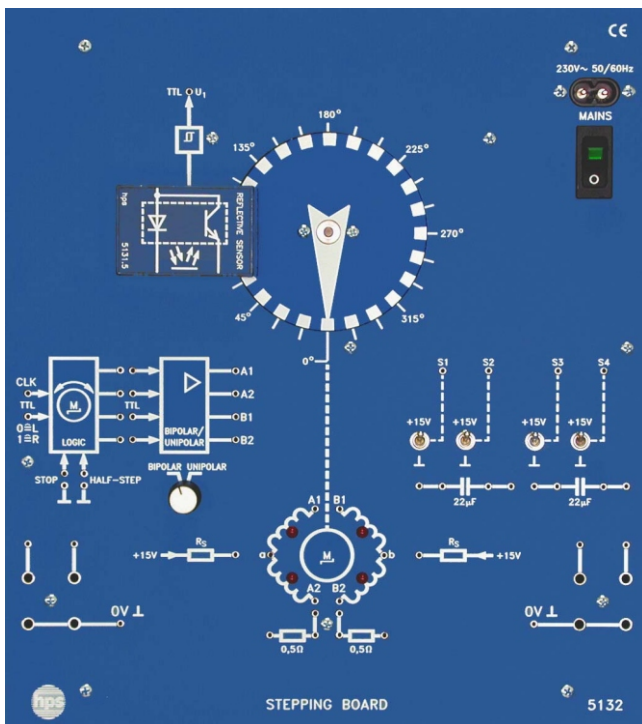
Type 3530

Subject to technical modifications.



STEPPING BOARD

Type 5132



STEPPING BOARD
(Type 5132)

- Universal stepping motor for digital technology and power electronics
- Digital recording of the angle and number of revolutions by a plug-in reflective sensor
- Digital control inputs for both senses of rotation
- With built-in control logic
- Bipolar and unipolar function of the stepping motor

With the STEPPING BOARD hps SystemTechnik offers a controlled system which can be used in digital automatic control engineering as well as in power electronics.

The STEPPING BOARD Used as a Stepping Motor

The stepping motor used in the STEPPING BOARD can be manually examined in half and full stepping operation (unipolar) by means of 4 switches.

A control logic with downstream amplifier allows operation with a square-wave generator (TTL level), for ex-

ample with the hps DIGI BOARD 2 or a PC interface.

The direction of rotation can be preselected by logic 0 Δ L or logic 1 Δ R.

Without the control logic level the amplifier can be actuated with a digital pulse sequence via four inputs (TTL level), for example with the hps DIGI BOARD 2, the hps PC CONTROL BOARD or a PC interface.

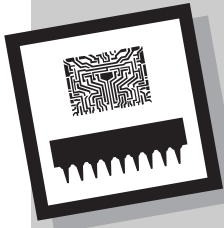
Two built-in amplifiers allow to select unipolar or bipolar drive.

The stepping motor of the STEPPING BOARD is equipped with an encoder disk on which 24 lines are printed. These lines are incrementally registered with a plug-in reflective sensor and converted iUse as a and a synchronous motor

Digital recording of the angle and nunto the according digital pulses. The digital pulses are lead over a Schmitt trigger and can be used as TTL signals for determining the number of revolutions and the angle of rotation.

The STEPPING BOARD in Power Electronics

The STEPPING BOARD can be directly connected to the sine modulated pulse-width modulation (PWM) of the hps POWER BOARD through a built-in phase shifter. This allows to examine the function of a frequency converter in connection with a motor.



STEPPING BOARD

Type 5132

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

Mechanical Data

The front panel of the STEPPING BOARD is made of 5 mm Thick laminate, matt blue in 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.

Accessories Included

- Reflective Sensor (Type 5131.5)



with built-in LED photo darlington transistor.
Dimensions (without plugs): 37 x 56 x 35 mm (w x d x h),
weight: approx. 50 g

- 4 Connecting plugs, 2 mm

Accessories Recommended

- Experiment manual:
„Experiments with the STEPPING BOARD“
(Type V 0123)
- Software:
DIGIWIN (Type 3890.4)

Digital Technology

Technical Data

Mains connection

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

Motor

- Stepping motor, 2-phase
- Rated voltage: 12 V
- Current consumption: max. 0.4 A per phase
- Resonant frequency: 15 Hz ... 35 Hz

Voltage supply

- +15 V in unipolar mode, for each phase

Encoder disk

- Speed: 300 min⁻¹
- Resolution: 24 pulses (lines) / revolution

Plug-in field (4 mm jacks)

for the use of the Reflective Sensor (Type 5131.5) with the encoder disk

Output (U₁)

Output voltage: TTL, decoupled through TTL module.
The output signal is incremental and only existing with plugged Reflective Sensor.

Adapter fields

The adapter fields serve for change-over from 4 mm to 2 mm plug connections and to plug-in adapters (BNC jack → 4 mm plugs).

Amplifier

- All inputs: TTL level

Control logic

- CLK input: TTL level
- Input below: TTL level
logic 1 \triangleq clockwise
logic 0 \triangleq anticlockwise

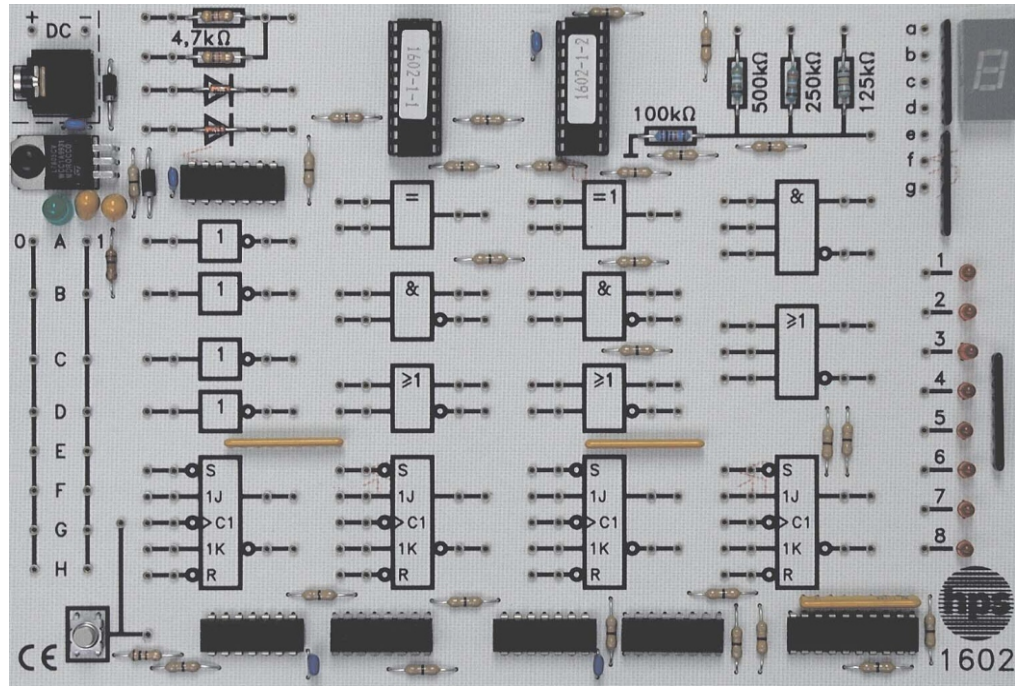
Dimensions and weight

- 266 x 297 x 90 mm (w x h x d);
weight: approx. 1.2 kg

Subject to technical modifications.

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

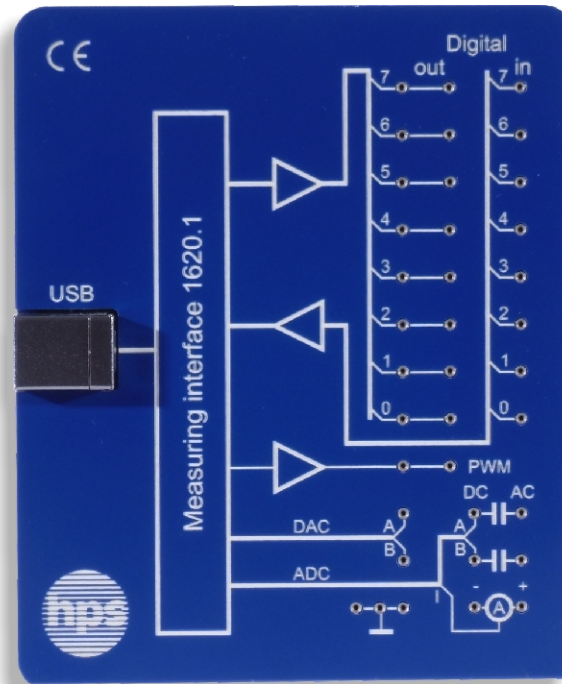
- Power supply: 12 V DC (from plug-in power pack provided)
- Internal supply voltage: 5 V (TTL)
- Dimensions of the board: 190 mm x 130 mm

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

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)

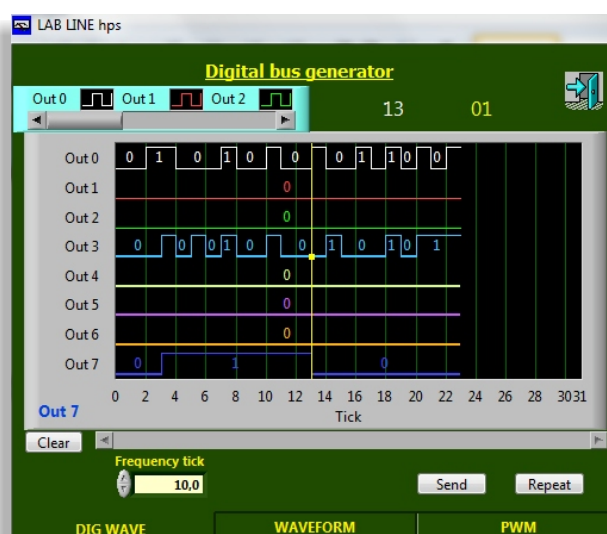
System requirement: Windows
XP / Vista / Win7-32/64 bit

Interface: USB 1.1 or higher

Software CD: 1620.1 EVGB



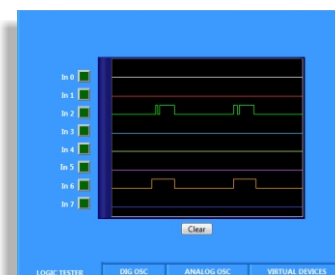
DIG WAVE (Digital Bus Generator)



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

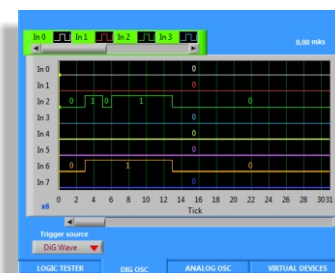
LOGIC TESTER

Inputs:
Digital in 0 - 7

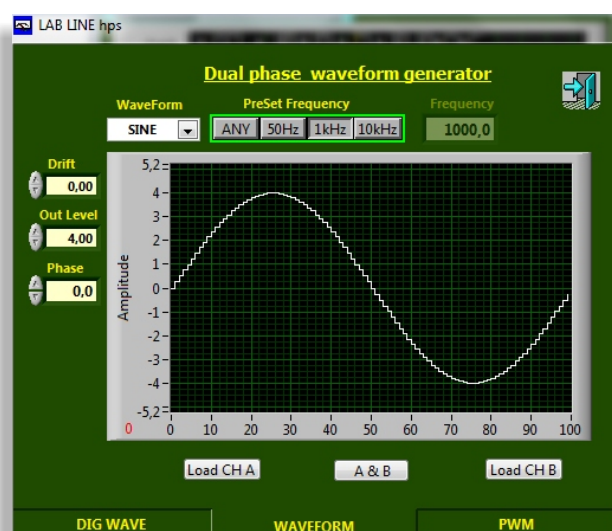


DIG OSC (Digital Oscilloscope)

Inputs:
Digital in 0 - 7

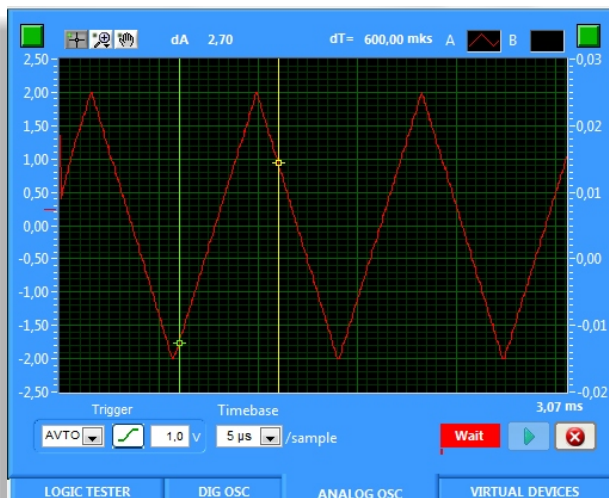


DUAL PHASE WAVEFORM GENERATOR



- 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

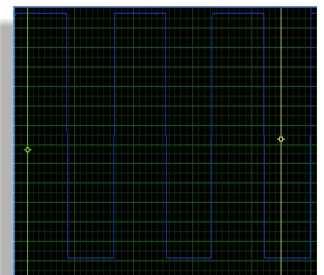
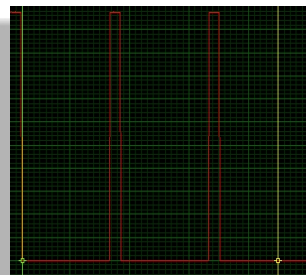


- Two channel oscilloscope
- Input voltage max. 0...10 V
- Frequency approx. 10 kHz
- Trigger Auto, Ch-A and Ch-B, pos. / neg.
- Variable time base 5 µs ... 5 ms / sample
- Autoscale function
- Zoom function
- Cursor, to read the values directly
- Colours and parameters of the display are adjustable

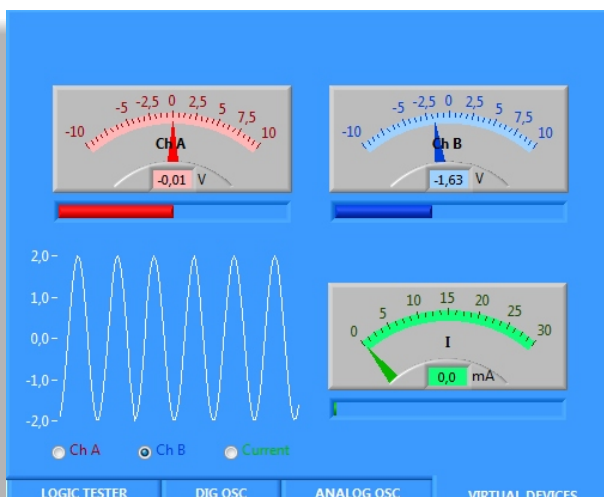
PWM WAVEFORM GENERATOR



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

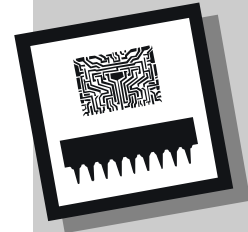


VIRTUAL DEVICES



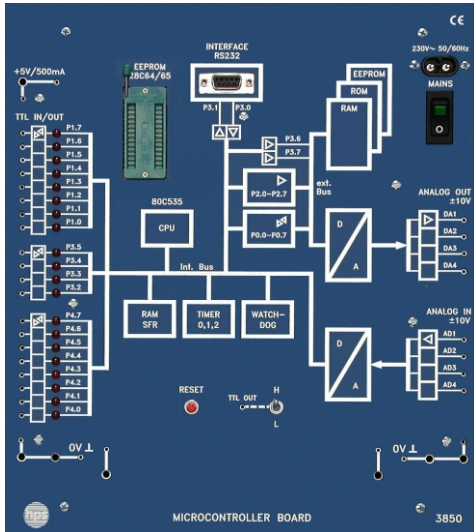
- Analogue display for Ch-A and Ch-B
- Free scalable, with value and beam display
- Writing function
- Analogue display for the current input
- Free scalable, with value and beam display

Digital Technology / Microcontroller Technology



MICRO-CONTROLLER BOARD

Type 3850



- Universal training system for microcontroller technology
- Control of the microcontroller by means of a terminal program
- Programming in BASIC and Assembler
- Communication with an IBM-compatible PC over RS 232 interface
- 20 digital inputs or outputs, 4 analog inputs and 4 analog outputs
- 32 KB ROM, 32 KB RAM, 8 KB EEPROM

With the MICROCONTROLLER BOARD hps System-Technik has developed a training system which is perfectly suitable to introduce into microcontroller technology.

A Siemens microcontroller (80535) which is part of the processor family 8051 has been chosen as the basic module.

In addition to the MICROCONTROLLER BOARD, an IBM-compatible PC is necessary to complete the training system. Connection is made over an RS 232 interface.

The delivered software provides the development environments μ Vision2 (Brand: Keil Software) and BASCOM LT DEMO (Brand: MCS-Electronics). Since these programs are free demo versions, the size of self-programmed files is limited to 2 kbyte.

μ Vision2 provides an Assembler, an ANSI-C-Compiler, a Linker and a Debugger.

BASCOM LT DEMO is a BASIC-compiler, which converts the interpreter code to a faster machine code. The BASIC-codes could be executed in the terminal emulators (monitor mode).

For the data transfer of the compiled programs to the MICROCONTROLLER BOARD the programs 8051winLight or 8051win (Brand: SIMulations-SOFTware) could be purchased.

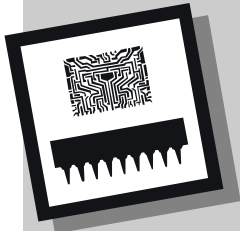
20 TTL inputs or outputs are freely programmable (per bit or per byte) on the MICROCONTROLLER BOARD.

Apart from these functions, it is possible to compare operations at the outputs, to control the timers and to use it as external interrupt source. The three timers are configured as counter, prescaler, timer, event recorder and gate time counter.

The AD converter has a resolution of 10 bits. It is reached in two steps of 8 bits each and realized over the software. It is also possible to choose a resolution of 8 bits, while the converting time in this case is 13 μ s.

The AD converter is selected via four analogue inputs in multiplex mode. Direct, register or bit addressing of the internal RAM is possible.

Other modules on the MICROCONTROLLER BOARD are the 32 KB RAM (program and data storage), the 32 KB ROM with a terminal emulator, the 8 KB EEPROM for data storage (optional), as well as four DA converters for the output of analogue voltages.



MICRO- CONTROLLER BOARD

Type 3850

Mechanical Data

- Material of the front panel:
Laminate (5 mm), matt blue
- Rear front:
Grey plastic cover (angled)
- Dimension: 266 x 297 x 90 mm (w x h x d)
- Weight: approx. 2.2 kg

Accessories Included

- Software:
 - Evaluations-Software μ Vision2
Brand: Keil Software (English-version) and
 - BASCOM LT DEMO
Brand: MCS-Electronics (English-version)
- Serial interface cable, 9-pin (SUB-D),
Length: 2 m

Accessories Required

- IBM-compatible computer with RS 232 interface
(Windows 98 or higher)

Accessories Recommended

- **Experiment manual:**
Microcontroller Technology (V 0150)
- EEPROM 28C64 or 28C65 (Type 3850.4)
- 8051winLight (Brand: SIMulations-SOFTware, available in German- and English-version): Data communication software for compiled programs to the MICROCONTROLLER BOARD.
Or 8051win (Brand: SIMulations-SOFTware, available in German- and English-version): With additional simulation of microcontroller on the PC.

Digital Technology / Microcontroller Technology

Technical Data

Mains connection

- Mains voltage: 230 V AC / 115 V AC (110 V AC)
- Mains frequency: 50 ... 60 Hz
- Power consumption: 40 VA

Voltage source (for connection of external equipment)

- 5 V / 500 mA
(connection through 2 mm or 4 mm jacks)

MICROCONTROLLER: Type Siemens 80C535

TTL IN / OUT (connection through 2 mm jacks)

- 20 inputs or outputs (bit addressable)
- State indication by LED
- Fan-out: 3
- Protected against overvoltage;
Input voltage: max. 24 V;
Input current: max. 180 mA

ANALOG IN (connection through 2 mm jacks)

- Inputs: 4 (multiplex mode)
- Input voltage: -10 V ... +10 V
- Input resistance: 1 M
- Converting time: 8 bit within 13 μ s
- Resolution: max. 10 bit

ANALOG OUT (connection through 2 mm jacks)

- Outputs: 4
- Output voltage: -10 V ... +10 V
- Output current: 20 mA
- Converting time: 800 ns

Memories

- 32 KB ROM
- 32 KB RAM
- 8 KB EEPROM (optional); Type: 28C64 or 28C65;
Access time: 200 ns;
can be plugged to 28-pin DIL IC socket base on the front side, with quick-fastening device

RAM, SFR: internal 256-Byte-RAM and control register

TIMER: 3 freely programmable timers

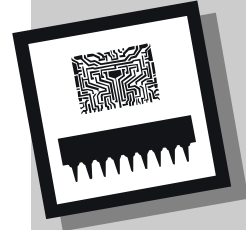
WATCHDOG: for processor control

INTERFACE RS 232: serial interface RS 232, for connection to the PC

RESET: to initialise the controller

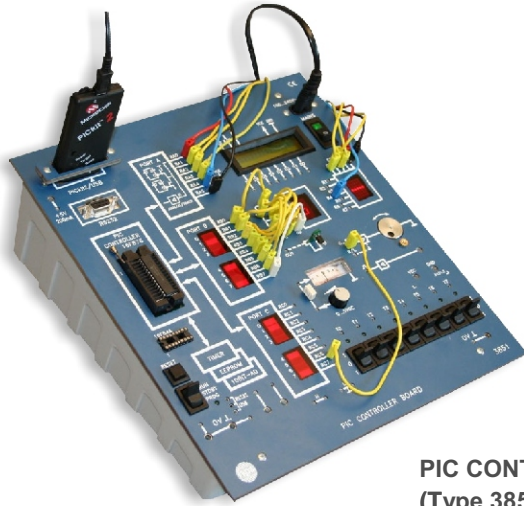
START-RAM: starts the program in the RAM from address 0

Subject to technical modifications.



PIC CONTROLLER BOARD

Type 3851



PIC CONTROLLER BOARD
(Type 3851)

- Universal training system for microcontroller technology
- Usually with varying PIC Controllers (16F84A, 16F876A,...)
- Programming in Assembler, only 35 commands necessary
- Communication with an PC over RS 232 interface, optional over USB interface
- Plugging of the PIC Controller with a external socket
- Output for pulse-width modulation (16F876A)
- Many applications are integrated on the PIC CONTROLLER BOARD:
 - Adjustable DC-generator
 - Spring-loaded switch
 - LCD-display in 2 lines
 - 7-segment display
 - Dot matrix display
 - LED-display
 - Sensor for temperature
 - DC-motor
 - Analogue measuring instrument
 - Optional rotation speed measurement
- Suitable for PAL experiments (16F84A)

With the PIC CONTROLLER BOARD hps SystemTechnik has developed a training system, which is perfectly suitable to introduce into PIC microcontrollers, which are used throughout the industry.

The trainings system uses the following PIC Controller:

- 16F84A (8bit microcontroller with 2 ports)
Brand: Microchip

- 16F876A (8bit Microcontroller with 3 Ports)
Brand: Microchip

To conduct experiments a PC with a serial port is needed (optional a USB in-

terface can be used, in that case a module USB Interface PICKit2 (Type 3851.4) is required).

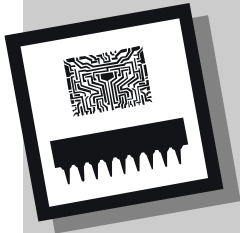
The advantage of the PIC CONTROLLER BOARD is, that many applications are integrated on the board. The student can immediately execute and test his written programs.

The applications are clearly arranged and the applications are practice-oriented placed on the PIC CONTROLLER BOARD.

Samples of programmes are provided for the built-in applications.

The system is especially suited to schools and company where apprentices are trained.

For the most used PIC Controller 16F876A a fast clamping device is built in, therefore the controller can easily be exchanged.



PIC CONTROLLER BOARD

Type 3851

Digital Technology / Microcontroller Technology

Software

Following easy to handle software is used:

- MPLAB (Brand: Micro-tech) Assembler, Editor, Compiler, instruction set with 35 commands
- ProgPIC2
Software for download from a PC on the PIC CONTROLLER BOARD

- Examples of programs for the PIC Controller (16F84A/16F876A)
- Optional for use of the USB-PICkit2-Interface
 - PICkit2 Download-software

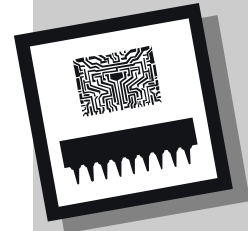
for every application an example of programs provided.

The software is part of the scope of delivery

Technical Data for the used PIC Controller

	<u>PIC 16F84A</u>	<u>PIC 16F876A</u>
Housing:	18 pin	28 pin
Microcontroller:	8 bit	8 bit
CPU:	RISC	RISC
Commands for programs:	35	35
Oscillator:	4 MHz	4 MHz
Sources of interrupts:	4	13
Watchdog timer:	1	1
PORTS:	2	3
Port A (RA0-RA4/5):	5 I/O-pins bi-directional – RA4 as timer	6 I/O-pins bi-directional – 1 timer – 5 inputs analogue
Port B (RB0-RB7):	8 I/O-pins bi-directional – 1 external interrupt – RB6/7 for programming	8 I/O-Pins bi-directional – 1 external interrupt – RB6/7 for programming
Port C:	not provided	8 I/O-pins bi-directional – 1 timer – 2-PWM-outputs (pulse-width modulation) – USART port inputs/outputs

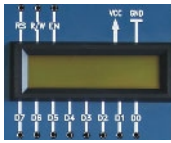
Digital Technology / Microcontroller Technology



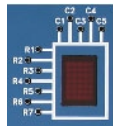
**PIC
CONTROLLER
BOARD**

Type 3851

Integrated applications on the PIC CONTROLLER BOARD



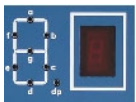
LCD-display



Dot matrix display



Analogue measuring
instrument and adjustable
DC-Generator



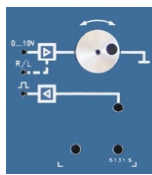
7-segment- display



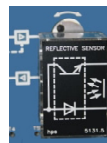
Temperature sensor



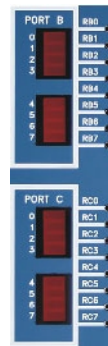
Spring-loaded switches



DC-Motor and
with rotation speed
measurement



Optional with
reflective sensor
(type 5131.5)



LED-display of the
I/O switch states

Mechanical Data

- Material of the front panel:
Laminate (5 mm thick), matt blue
- Rear front: Grey plastic cover (angled)
- Dimensions: 266 x 297 x 125 mm (w x h x d)
- Weights: approx. 2.2 kg

Accessories Included

- Freeware-CD
 - Software MPLAB (Brand: Microchip)
 - Software ProgPIC2 (english)
 - Software PICKit2 (Brand: Microchip)
 - Examples of programs
- Serial interface cable, 9-pin (SUB-D), length: 2 m

Accessories Necessary

- PC with a RS-232 interface (up to Windows 98)
- Optional: For the use of an USB interface the modul PICKit2 (Type 3851.4) is required.
- Optional: hps reflective sensor (Type 5131.5) for the rotation speed measurement of the motor

Subject to technical modifications.

Technical Data

Mains Connection

- Mains voltage: 110 ... 240 V AC
- Mains frequency: 50 ... 60 Hz
- Power consumption: 10 VA

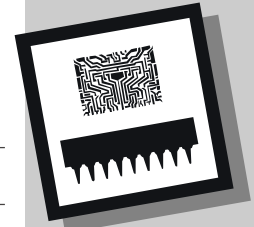
Power supply (for connection external units)

- 5 V / 100 mA
- Connection through 2 mm or 4 mm jacks (secured with PCT against short-circuit)

Applications

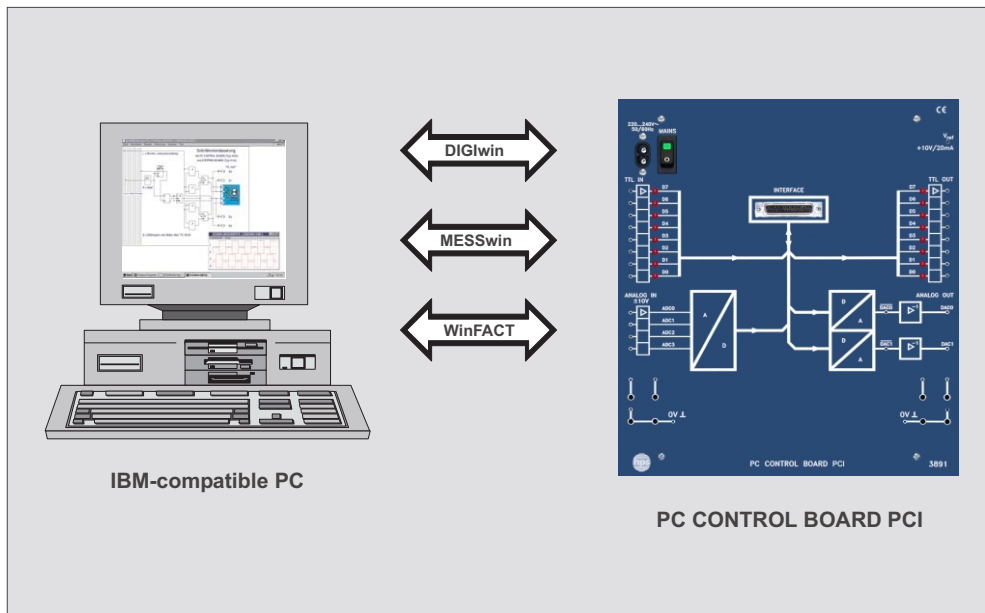
All connections are fed through 2 mm jacks.

- DC generator with potentiometer adjustable
- 8 spring-loaded switches: 5-V-signal with LED
- LCD-display: two line LCD-display, operated with 4-bit or 8-bit; D0-D7, RS, RW, EN
- 7-segment- display:
LEDs directly operated with the I/O Ports
- Dot matrix display:
LEDs 5x7 directly operated with the I/O Ports
- LED-display: for indication of the switch states all inputs and outputs (Port B and C)
- Temperature sensor (PTC): -50 °C ... 150 °C
- DC motor with fly wheel and markings for rotation speed measurement: Input 0 ... 5 V TTL-input for right-handed and left-handed rotation
- Analogue measuring instrument: 0 ... 5 V
- Optional: hps reflective sensor (Type 5131.5) for the rotation speed measurement of the motor (TTL-level)



PC CONTROL BOARD PCI

Type 3891



- Universal interface for digital technology, control engineering and measuring
- Software programs for digital technology, control engineering and measuring
- Direct connection of hps Boards possible:
DIGI BOARD 2, MOTOR BOARD, SERVO BOARD, STEPPING BOARD, and PID BOARD
- 4 analog inputs, 2 analog outputs / 8 digital inputs and outputs

The PC CONTROL BOARD PCI serves as an interface between a commercially available PC (IBM-compatible) and the Boards for digital technology, control engineering and measuring contained in the hps program.

Three software programs are offered for the PC CONTROL BOARD PCI:

- **DIGIwin**
- **MESSwin**
- **WinFACT**

DIGIWIN can be used to design, simulate and analyse any digital circuits. The program provides numerous components for this purpose.

External devices such as the hps DIGI BOARD 2 can be included in the simulation in connection with the PC CONTROL BOARD PCI.

MESSwin is an object-oriented programming environment for tasks in the field of measuring, controlling and regulating.

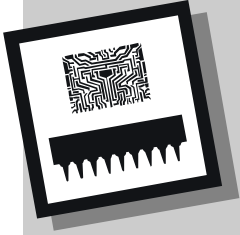
MESSwin can be used for example in connection with the PC CONTROL BOARD PCI for position control with the hps SERVO BOARD or for speed control with the hps MOTOR BOARD.

WinFACT is an innovative modular software program for analysis, synthesis and simulation in control engineering with the simulation system BORIS as its basic module.

It can be expanded by a fuzzy shell for analyzing

fuzzy systems. The fuzzy systems generated with FLOP can be integrated in the block oriented simulation of BORIS.

WinFACT was especially designed for use in vocational, technical and academic schools, but is also appropriate for use in industry and research.



PC CONTROL BOARD PCI

Type 3891

Mechanical Data

The front panel of the PC CONTROL BOARD PCI is made of 5 mm thick laminate, matt blue in 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.

Accessories Required

- IBM-compatible PC with Windows 95 / 98 / NT 4.0 / 2000 / ME oder XP, free slot for PC Plug-in Card (5 V)
- PCI-I/O Card (hps Type 2736) with Connecting lead

Available Software

- **DIGIwin:**
Simulation software for digital technology
- **MESSwin:**
Object-oriented programming environment for tasks in the field of measuring, controlling and regulating.
- **WinFACT:**
Software for analysis, synthesis und simulation in the control engineering

Digital Technology / Control Engineering / Measuring

Technical Data

Mains connection

- 220 V AC ... 240 V AC / 115 V AC (110 V AC); approx. 15 VA; 50 ... 60 Hz

INTERFACE CONNECTION

To the Slot Card in the PC via a 25-pin Sub-D plug

TTL IN

- Inputs: 8 (D0 ... D7)
- Input voltage: TTL level (5 V)
- Display: LED

ANALOG IN

- +/-10 V
- Inputs: 4 (ADC0 ... ADC3); multiplex mode
- Input voltage: -10 V ... +10 V (tolerance: +/-200 mV)
- Input resistance: 1 M

TTL OUT

- Outputs 8 (D0 ... D7)
- Output voltage: TTL level (5 V)
- Display: LED

ANALOG OUT

- 2 Outputs: inverted / not inverted, over digital to analog converters
- Output voltage: -10 V ... +10 V; (tolerance: +/-200 mV)

V_{ref}

- Output voltage: +10 V; 20 mA
e. g. for SERVO BOARD (Type 5131)

PCI-I/O Card (hps Type 2736)

- PCI slot (5 V)

Adapter fields

The adapter fields serve for change-over from 4 mm to 2 mm plug connections and to plugin adapters (BNC jack 4 mm plugs). Wiring of the inputs and outputs of the PC CONTROL BOARD PCI via 2 mm jacks.

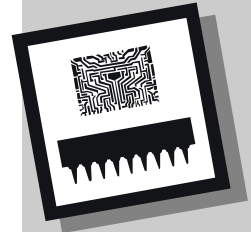
Dimensions and weight

- 266 x 297 x 90 mm (w x h x d); weight: approx. 1.5 kg

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

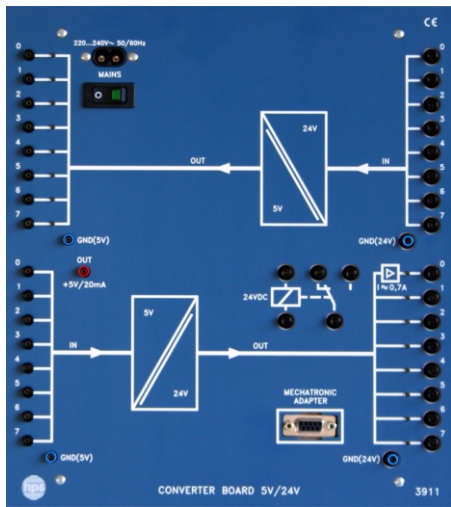
Subject to technical modifications.

Digital Technology / Automation Technology



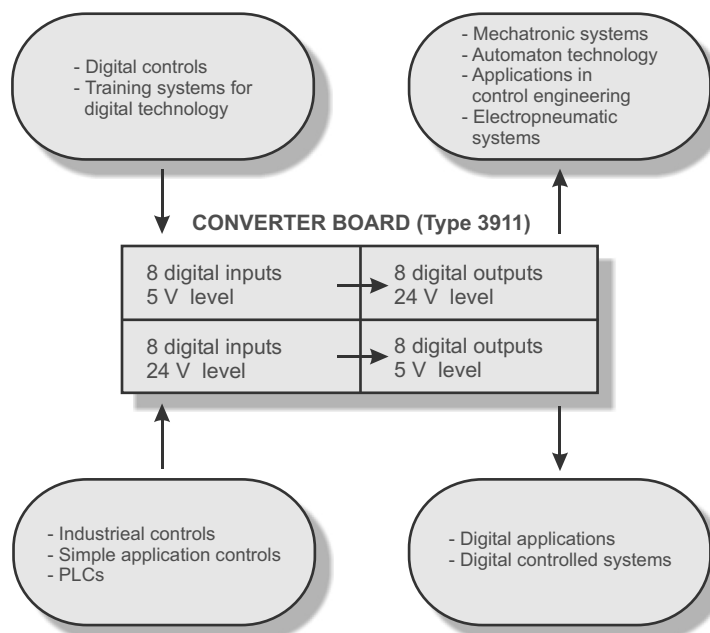
CONVERTER BOARD 5V / 24V

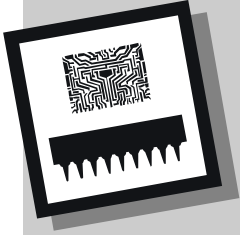
Type 3911



- This device can be used universally because of the level conversion from 5 V to 24 V signals and from 24 V to 5 V signals
- The 5 V and 24 V connections are separated electrically by optocouplers
- 8 digital 5 V inputs are converted to 8 digital 24 V outputs
- 8 digital 24 V inputs are converted to 8 digital 5 V outputs
- Both standard cables (2 mm and 4 mm) and safety cables can be used
- Adapter for connecting mechatronic systems
- Built-in power supply
- Freely wirable relays
- All outputs are short-circuit-proof
- The statuses of the outputs are indicated by LEDs

Application possibilities of the CONVERTER BOARD





CONVERTER BOARD 5V / 24V

Type 3911

Digital Technology / Automation Technology

Technical data

Mains connection:

220 V AC ... 240 V AC / 115 V AC (110 V AC);
approx. 40 VA; 50 ... 60 Hz

Inputs and outputs:

8 inputs 24 V DC
1 output 24 V DC / 750 mA
7 outputs 24 V DC / 75 mA
8 inputs 5 V (TTL compatible)
8 outputs 5 V (TTL compatible)

Relay:

Coil voltage 24 V DC; 1 changeover 230 V / 3 A

Mechatronic adapter:

9-pin Sub-D socket e.g. for connecting a conveyor belt

Mechanical data:

Material of front panel: laminate (5 mm thick)
Rear: angled plastic cover
Dimensions: 266 x 297 x 220 (w x h x d)
Weight: approx. 2.4 kg

Subject to technical modifications.



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E-Mail: export@hps-systemtechnik.com



8051win

The fast entry into the field of microcontroller engineering

(Type 002027)

8051win is a simulation software to visualize Assembler code files (Intel-HEX format) for microcontrollers, which work with the 8051 command set. You can generate these HEX files with each Assembler program. With **8051win** you can open and disassemble these files as well as consider the effect of each command cycle by cycle (fetch command... decode... start) or step by step. You have always an overview of all internal registers, the external program and data memory and the ports. With the cyclic command editing all data transfers inside the controller are illustrated graphically. The simulation speed is adjustable.

8051win is able to simulate the complete command set, or in model computer mode a reduced command set.

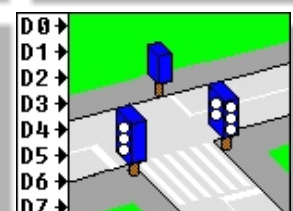
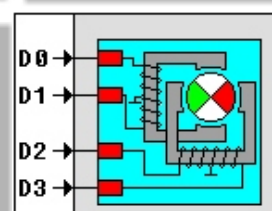
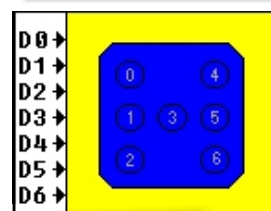
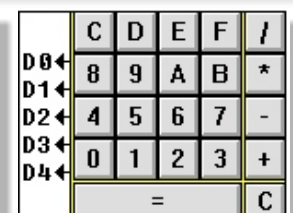
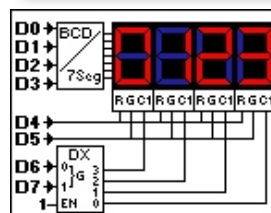
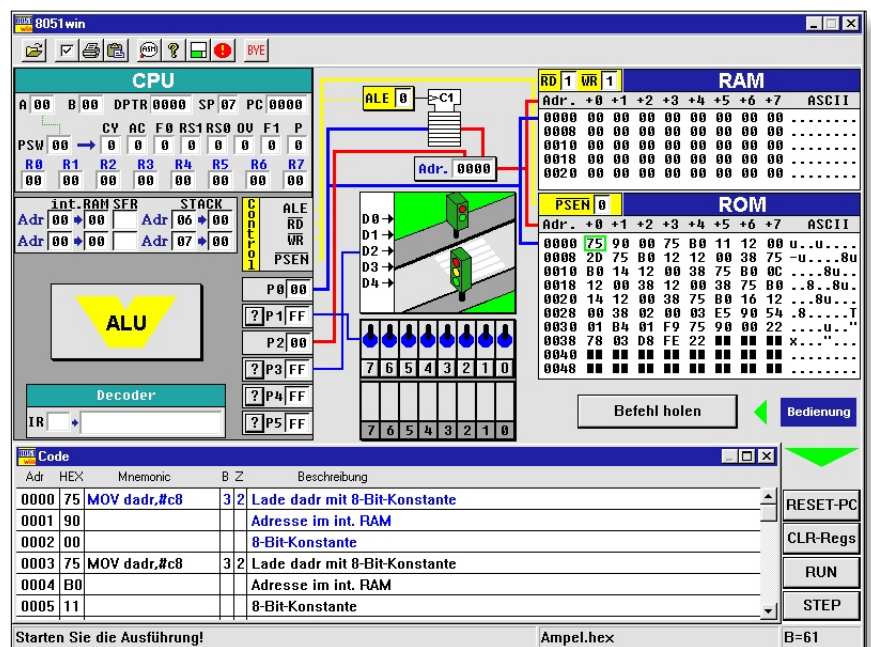
To the ports you can connect simulated I/O devices like switches, LEDs, traffic light models, etc.

8051win should be used as test instrument between the program development phases „Assembling“ and „Download to target system“. The software shows pro-found insights into the working method of a controller.

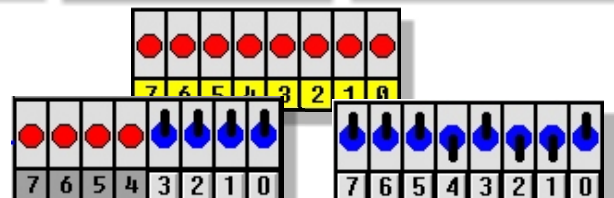
8051win needs no hardware for simulation.

System Requirements:

- PC with Windows® Software
- Hard disk: 10 MB free
- Working memory: 4 MB
- 3.5" disk drive
- SVGA graphic card (800 x 600)



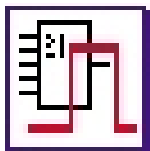
Learn to use
microcon-
trollers
quickly and
effectively





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DIGIwin

Object-orientated programming environment for digital engineering

(Type 002035)

DIGIwin is a simulation program for digital circuits and for controlling external devices. The circuits can be designed in Windows with standardized components and tested. When testing the signal levels of all lines can be displayed or watched as time diagram or truth table with 8 channels. The instruction list (IL) of PLC circuits can be generated. Circuits and time diagrams can be labelled and printed out.

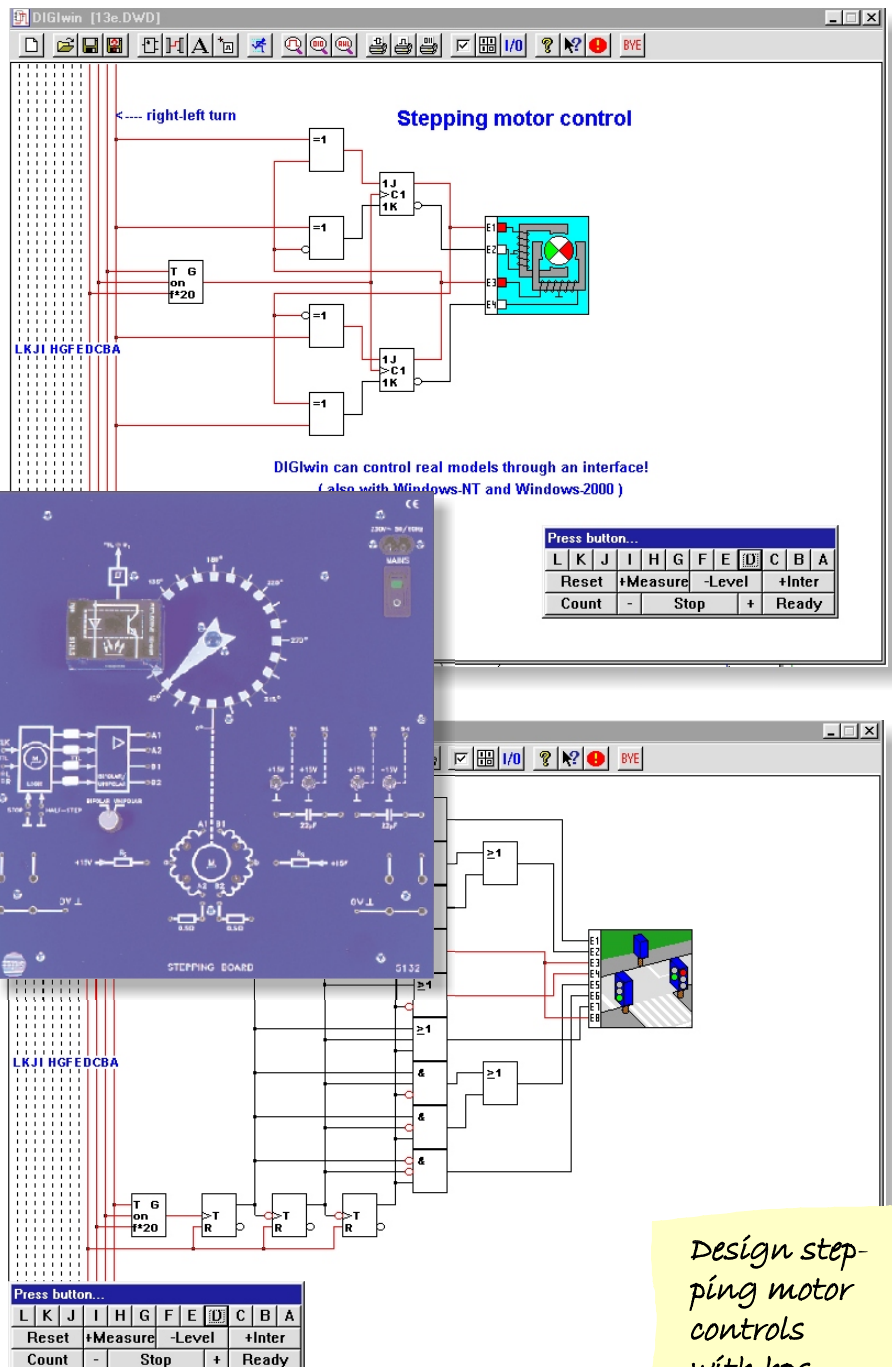
With the 32 bit version the interface additionally can be controlled with DIGIwin in Windows NT or 2000. DIGIwin helps you with the KV editor (2, 3 and 4 variables) to minimize combinatorial circuits. Besides all the necessary combinatorial circuits DIGIwin has a lot of sequential circuits like JKMS flipflop, 4 bit counter and shift register. 10 simulated models can be used (traffic light, stepping motor, press, ...).

From version 4.x onwards DIGIwin has components for integration of the KV diagram.

With the option STEPPING BOARD (Type 5132) and a slot card from hps SystemTechnik you can design control circuits for stepping motors (with detailed experiments manual).

System Requirements:

- PC with Windows® Software
- Hard disk: 10 MB free
- Working memory: 4 MB
- 3.5" disk drive
- SVGA graphic card (800 x 600)



*Design step-
ping motor
controls
with hps
hardware*

