- 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

## Assembly possibilities for the Module System Digital Technology



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





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

## **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

## **Universal Assembly Board**

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

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

Digital

Technology

Series 9400

Module System

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

- 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)

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





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Modules for Digital Technology

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.

### **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



Туре 9403



Type 9402



Type 9404

Squarewave voltage (TTL level); with series-connected divider; th can also be used separately; frequencies: 0.1 Hz; 1 Hz; 10 Hz; 10 Hz; 10 kHz; 10 kHz; 100 kHz; current consumption: 110 mA	e divider 0 Hz;
<b>Input Keyboard</b> Four pairs of keys (L/H); for generating LOW and HIGH states; HIGH state indicated by LED;	Type 94

**Clock Generator** 

# Type 9402

Type 9401

ing LOW and HIGH states; current consumption: 10 ... 50 mA

<b>OR Gate, AND Gate</b> 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	Туре 9403
Hexadecimal / Dual Coding Switch,	Туре 9404

#### Pushbutton Switch, Signal Source Contains one hexadecimal / dual coding switch (2-digit); one pushbutton

switch and one signal source (0 ... 5 V DC); current consumption: 7 ... 50 mA



## Modules for Digital Technology



Digital Technology

**Module System** 

Series 9400



Type 9405



Туре 9407



Type 9409



Type 9411





Type 9408



Type 9410



Type 9412



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

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

Type 9408

# Adder 4-bit full adder; with input and output carry; for addition of

two 4-bit dual numbers; current consumption: 50 ... 65 mA

Туре 9409

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

## Multiplexer, Demultiplexer

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 9410

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

### JK-Flipflop

**D-Flipflop** 

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

Type 9412





Modules for Digital Technology

**Digital Technology** 

## **Module System**

Series 9400



Type 9413



Type 9415



Type 9417



Type 9419



Type 9414



Туре 9416



Type 9418



Type 9420



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

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

<b>Binary Counter</b> The module contains one binary up / down counter, synchronous; 4 bits; current consumption: 20 40 mA	Туре 9417
·	
RAM 8 x 4	Type 9418

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

Type 9418

Type 9416

Type 9413

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



ALU

## **Modules for Digital Technology**



**Digital** Technology

**Module System** 

Type 9421

Туре 9422

Type 9423

Туре 9424

Series 9400



Type 9421

Type 9423



Type 9422



Type 9424



Туре 9425



HIGH / LOW

For tapping HIGH and LOW states;

the HIGH outputs are short-circuit-proof; current consumption: 10 ... 60 mA

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

Adapter (2 mm jacks / SUB-D socket)

For connection to a computer

Type 9425





**UNIVERSAL BOARD 1 / UNIVERSAL BOARD 2** 

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



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.



## DIGI MODULE BOARD (Type 3930)





Digital Technology

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DIGI MODULE BOARD (Type 3930)



Storage Board for digital modules (Type 3930.10)

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

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

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.

## 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)



## **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, 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.



Digital Technology

Module System

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