Digital Technology / Microcomputer Technology

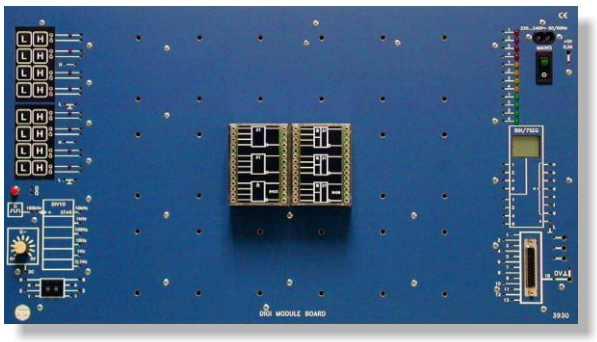
- **Modular training system for the fundamentals of digital technology / microcomputer technology**
- **Clear experiment assembly because only the modules required for the experiment need to be plugged in**
- **Individual expansion possibilities**
- **Detailed experiment descriptions**

Digital Technology

Module System

Series 9400

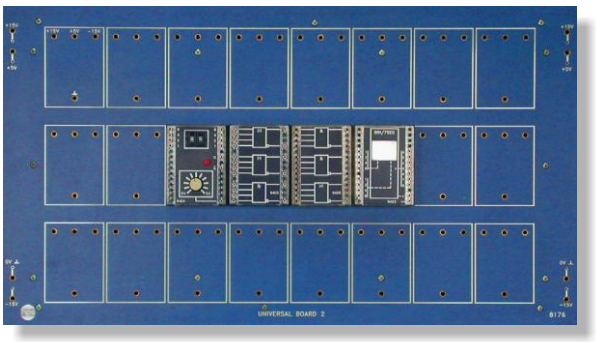
Assembly possibilities for the Module System Digital Technology



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

DIGI MODULE BOARD

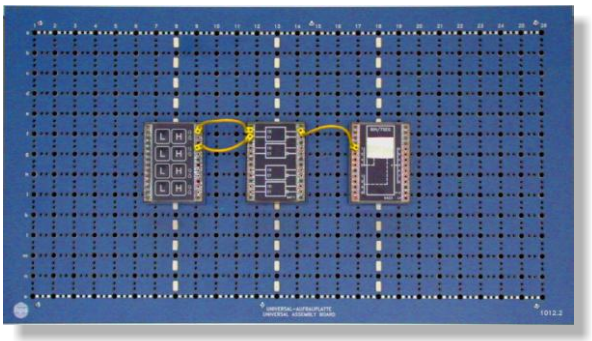
- Power supply, input and output units contained in the DIGI MODULE BOARD; this means shorter experiment setup times
- Clear storage of all modules on a separate imprinted storage board



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

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



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

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.

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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Digital Technology

Module System

Series 9400

Modules for Digital Technology

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.

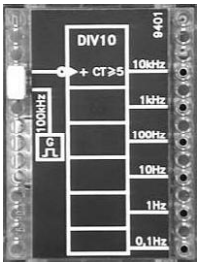
Technical Data of the Digital Modules (Types 9401 ... 9425)

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.

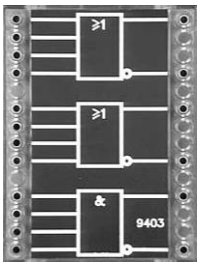
Other technical data

- 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

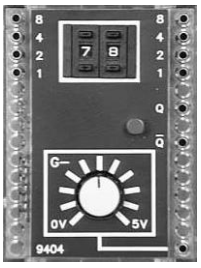


Type 9401

Type 9402



Type 9403



Type 9404

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

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

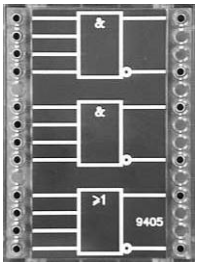
Hexadecimal / Dual Coding Switch, Pushbutton Switch, Signal Source **Type 9404**
Contains one hexadecimal / dual coding switch (2-digit); one pushbutton switch and one signal source (0 ... 5 V DC); current consumption: 7 ... 50 mA

Modules for Digital Technology

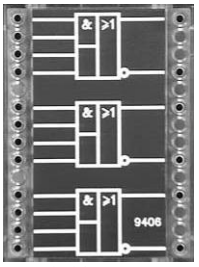
Digital Technology

Module System

Series 9400



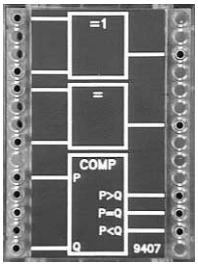
Type 9405



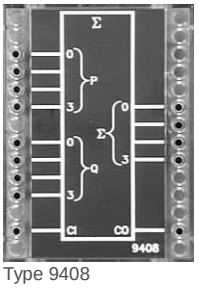
Type 9406

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



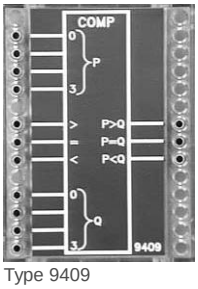
Type 9407



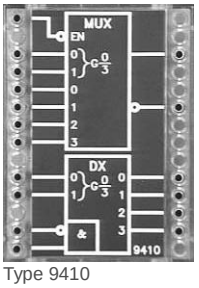
Type 9408

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



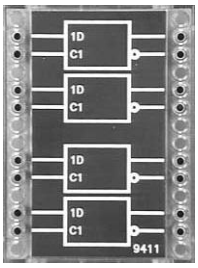
Type 9409



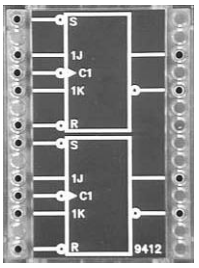
Type 9410

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

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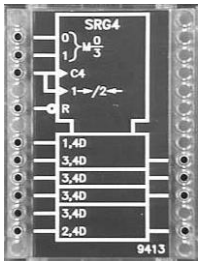
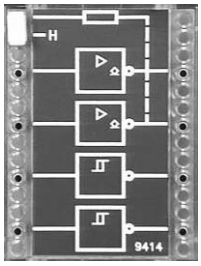
Modules for Digital Technology



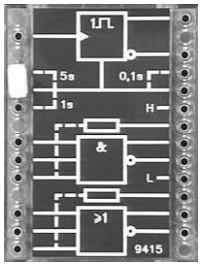
Type 9413



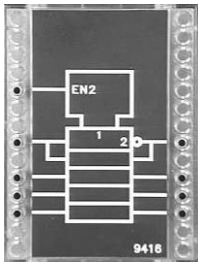
Type 9414

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



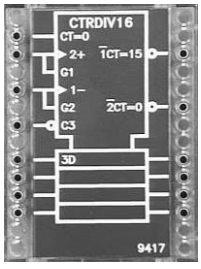
Type 9415



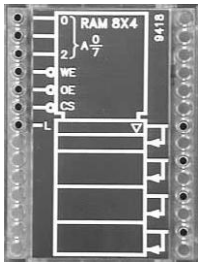
Type 9416

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



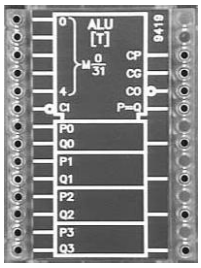
Type 9417



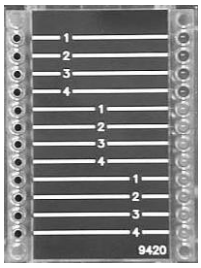
Type 9418

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

Modules for Digital Technology

Digital Technology

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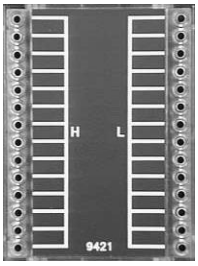
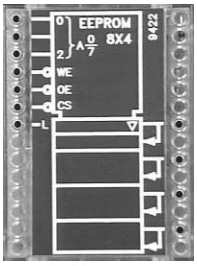
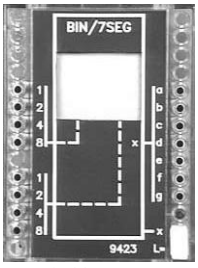


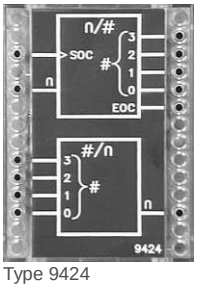
Type 9421



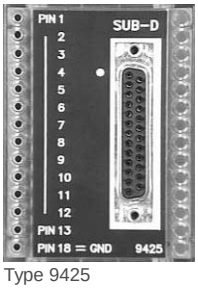
Type 9422



Type 9423



Type 9424



Type 9425

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

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

Adapter (2 mm jacks / SUB-D socket) **Type 9425**
For connection to a computer

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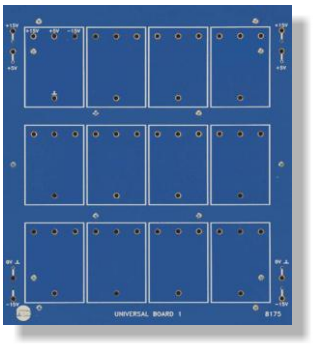
UNIVERSAL BOARD 1 / UNIVERSAL BOARD 2



UNIVERSAL BOARD 1
(Type 8175)

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

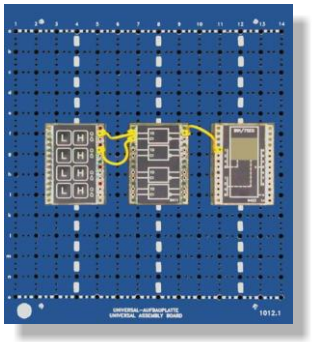
Dimensions/weight
- UNIVERSAL BOARD 1 (Type 8175):
  266 x 297 x 90 mm (w x h x d) / 1.33 kg
- UNIVERSAL BOARD 2 (Type 8176):
  532 x 297 x 90 mm (w x h x d) / 2.65 kg

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

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

The operating voltage for the Digital Modules (+5 V DC) is fed through two of these jacks. The other two jacks are for +/-15 V, e. g. for using analog modules.
A sturdy plastic cover protects the back of the Board. Its shape allows the Board to be placed at an ergonomically favourable angle e. g. on a table.

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

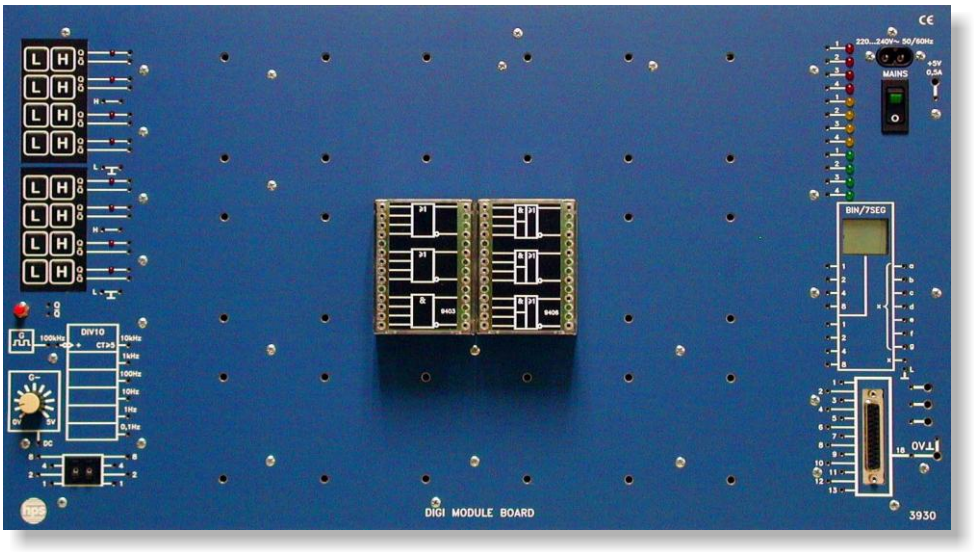
Front panel
5 mm thick laminate, matt blue in colour, white printing

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

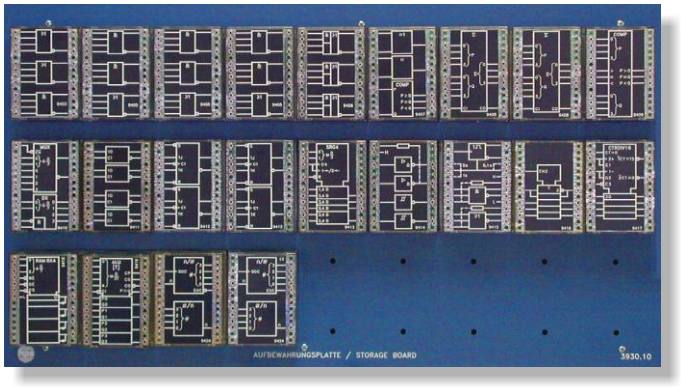
Dimensions/weight
- Universal Assembly Board (Type 1012.1):
  266 x 297 x 90 mm (w x h x d) / 1.25 kg
- Universal Assembly Board (Type 1012.2):
  532 x 297 x 90 mm (w x h x d) / 2.4 kg

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)



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.

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

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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 (wxhxd); 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, 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.