

## Introduction

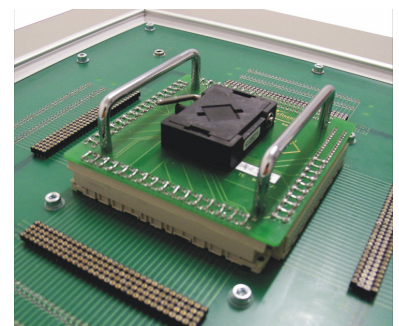
The PinTester features a complete test environment, which has been developed particularly for use in solid-state industries. Thanks to the steady increase of the degree of integration and complexity of integrated solid-state circuitry, flexible and adaptable test systems gain ever more importance.

The scope of performances of the PinTester was specially configured for characterization and analysis of electrical properties of pre-assembled electronic components and wafer structures. The main job of the system is to efficiently perform test sequences for design verification, fault analysis, and functional tests as well as reliability investigations. Thanks to its modular design, the PinTester can be adapted flexibly to the relevant testing job and expanded. The possibility to provide the system with customized specifications and extensions is particularly advantageous.



PinTester for 128/256 Pins

The operation of the PinTester takes place by means of the in-firm developed and innovative PinTester NT software. The named software is comprised of various system modules communicating one with another, thus ensuring configuration, operation, and control of various hardware components.



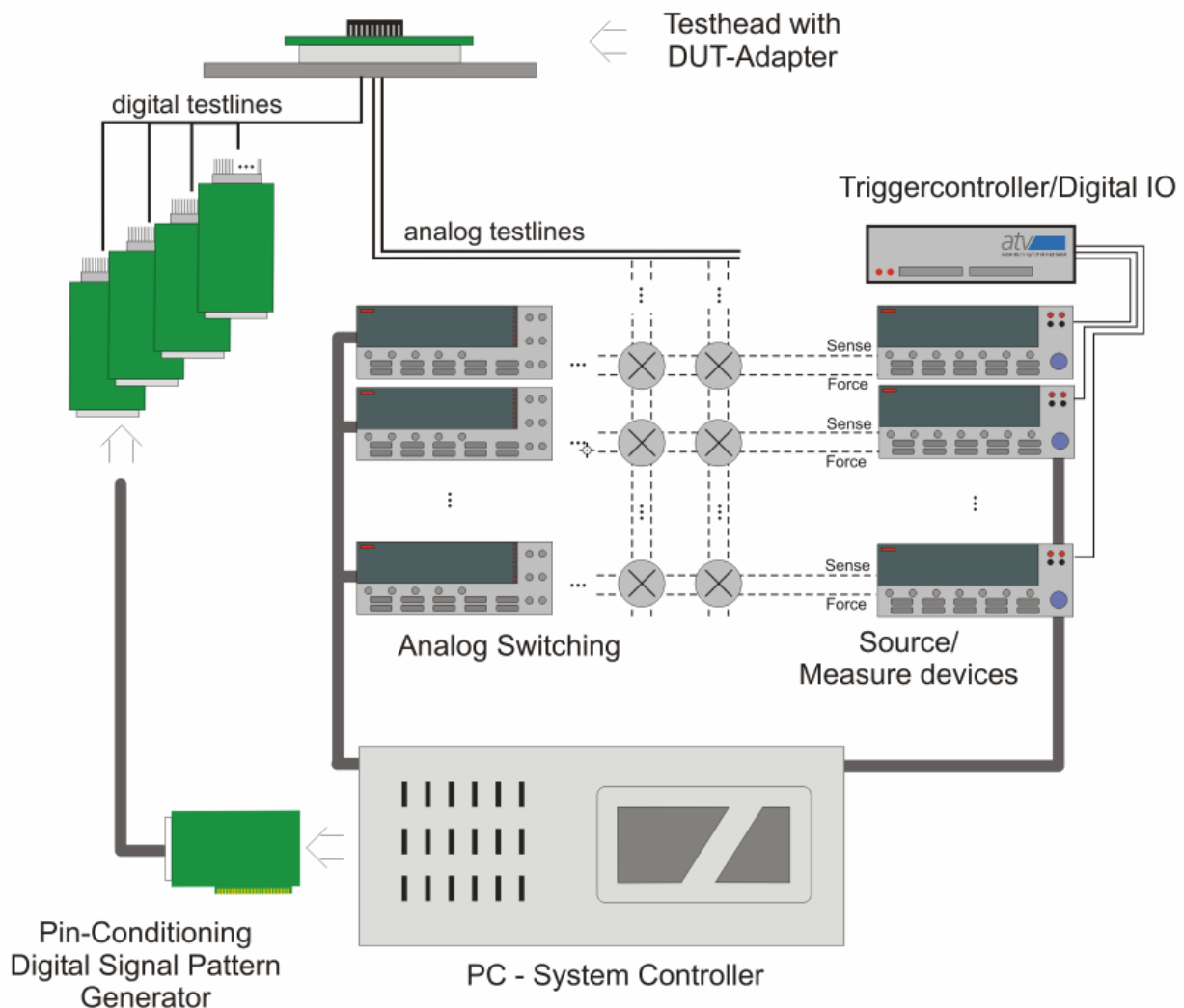
Verifier©  
kompatible Testadapter

## Constructive Design of the PinTesters

The basic design of the PinTester can be broken down into the following functional subgroups:

- precision current/voltage sources with integral multimeter,
- analog matrix to connect the test specimen ports to analog sources,
- trigger controller to synchronize the analog sources and to provide external digital I/O,
- digital pattern generator to generate, output, read-back digital signal patterns on all test adapter pins,
- test head as interface between PinTester and test adapters.

The following illustration shows the schematic design of the PinTester as well as the interaction of individual functional groups.



Schematic design of the PinTesters

The technical specifications of the individual functional PinTester groups will be explained in the following.



Keithley Modell 2612 A

### Sources and Meters

Instruments of Keithley brand, Model 26xx (dual-channel sourcemeter), are used as combined current/voltage sources with integral multimeter. This features the basic version of Keithley product family. Further to this version, other instruments with other source and measuring ranges are available.

The instrument can be operated in three test modes: Bias (constant-current and constant-voltage output), Sweep, and Pulse.



Keithley Modell 3706

### Control Matrix

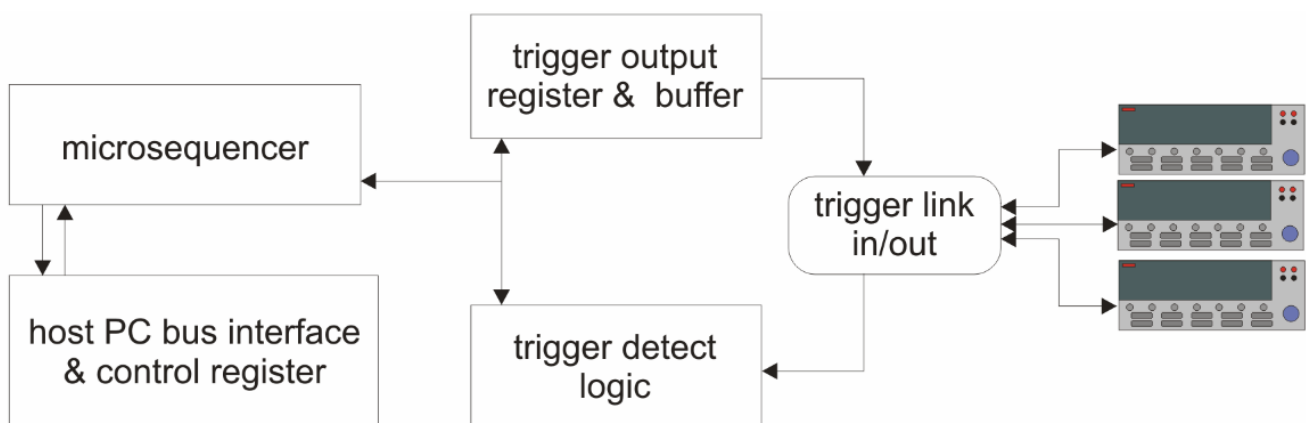
The control matrix is composed of the Keithley Model 3706 and associated Keithley Model matrix cards.

### Digital Signal Pattern Generator

The Digital Signal Pattern Generator is comprised of two components: High-Speed I/O-PC plug-in board (Spectrum MI.7021) and Pindriver cards for signal conditioning. The signal memory of the pattern generator can be extended up to a capacity of 512 MB. Levels and frequency of signal conditioning with the Pindriver card are variably adjustable. As a function of driven pins, the signal output frequency is at least 1 MS/s. 32 channels are provided on every Pindriver whereby each channel can be configured individually as input or output. The pattern design and evaluation take place by means of the PatternEditor software module.

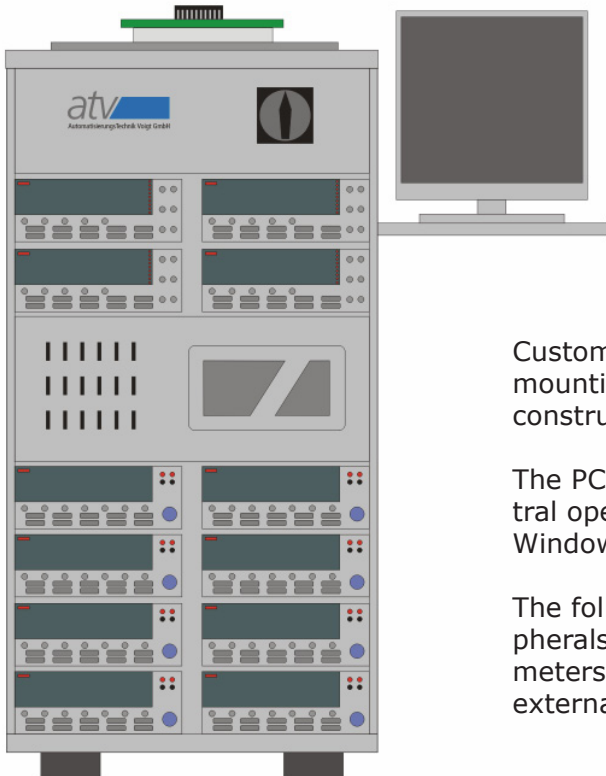
### Triggercontroller

The Trigger Controller is used to synchronize the analog meters as a function of time. The instruments get a trigger of equal clock time for simultaneous output of a current/voltage value or parallel measurement. So, any time lag by sequential triggering can be minimized. Further, the Trigger Controller provides 16 digital inputs/outputs to be used freely in the individual test sequences.



Prinzipskizze Triggercontroller

## Mechanical Construction



The system construction is made according to a 19" rack system, configured as a mobile upright unit with a test head fitted to the top. The size and arrangement of the units depends on the respective degree of extension as regards number of pins, matrix size and number of current/voltage sources.

Customer-owned units provided with compatible rack mounting design can also be incorporated in the system construction.

The PC is comprised in the system construction as the central operating and control unit. An industrial PC running with Windows XP® operating system is used.

The following interface ports are available for external peripherals and extensions: GPIB/IEEE-488 to connect external meters, Ethernet, PS/2 for keyboard/mouse, USB, and one external VGA screen monitor interface port.

## Test head

The test head can be configured in different versions:

- construction with plug connector layout compatible with Verifier© adapters (128/256 pins)
- mechanical press-fit contacts of changeable test adapters via Pogo-Pins/ Pogo-Tower
- making of customized test heads to match existent adapter layouts.

Additional connections to feed-in/feed-out signals as well as supplementary supply voltages can be made available.

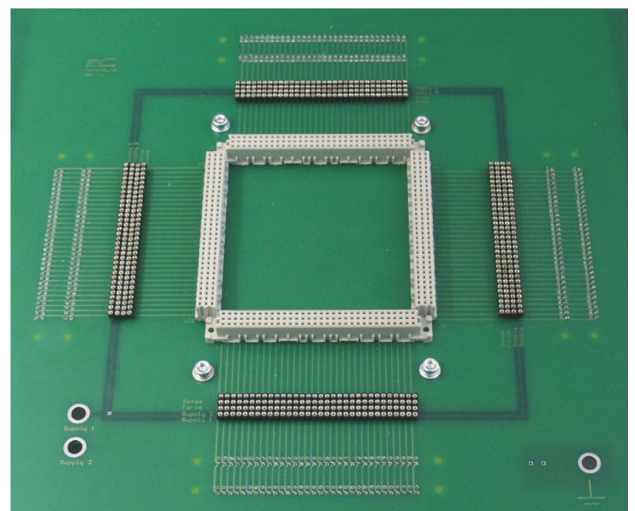


Fig. Test head compatible with Verifier© test adapters with additional signal feed-outs and voltage supply

## The Software CVC Suite

The CVC Suite features a modular application software specially conceived for automated test sequences in lab environments. The structure of the software can be compared to a building-block system, ensuring configuration of complex test sequences.

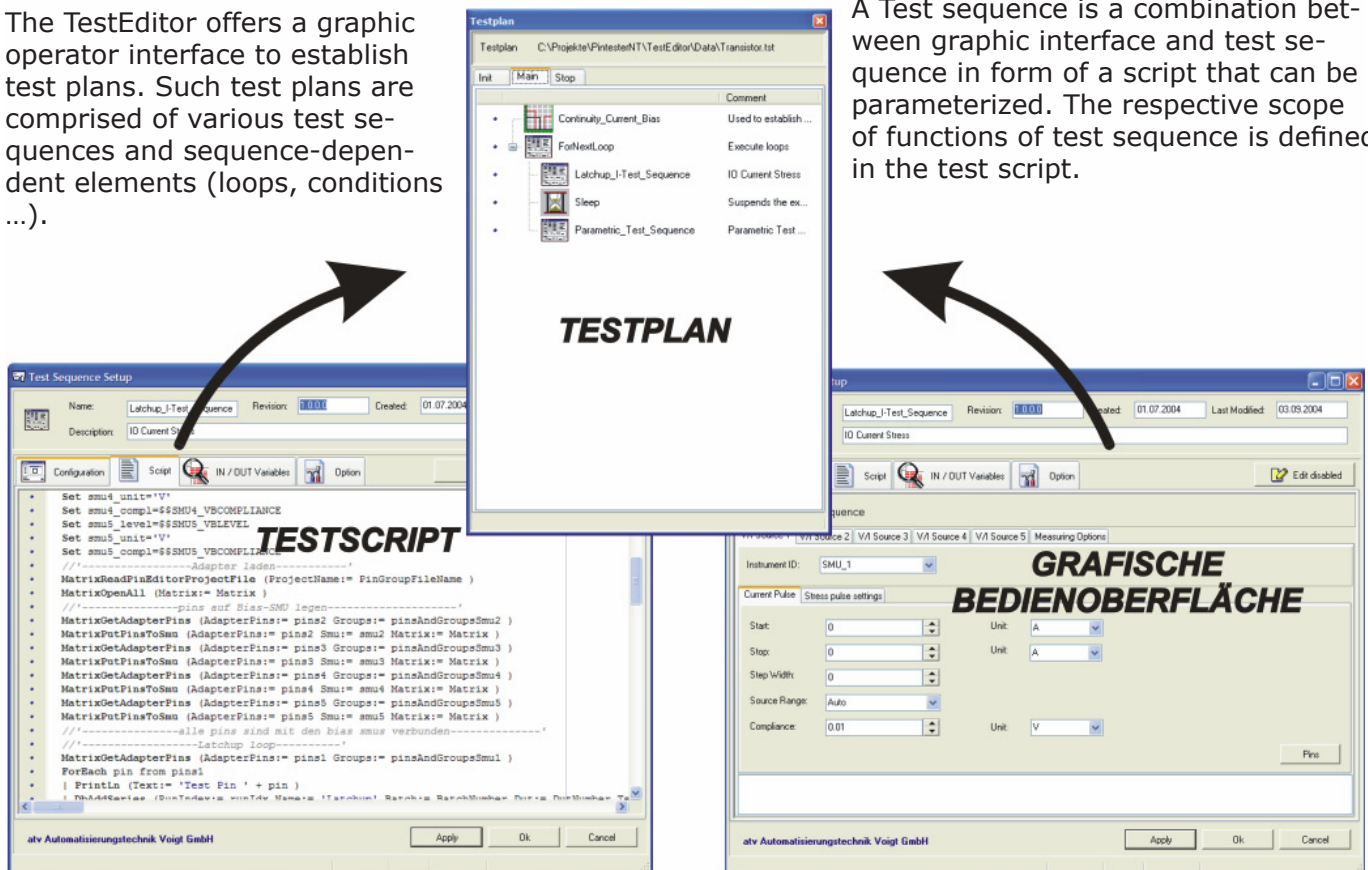
The RunTimeEngine (RTE) is the core of the software whose job is to run the test plans and to control the hardware. According to the respective application, other software modules can be connected to the RTE. The main software components are: TestEditor, PingroupEditor, and Database. The Database is used as the central memory of all data. Such data can be re-processed in other applications via export, copy, and print functions.

## Program Modules of the Software CVC Suite

### TestEditor

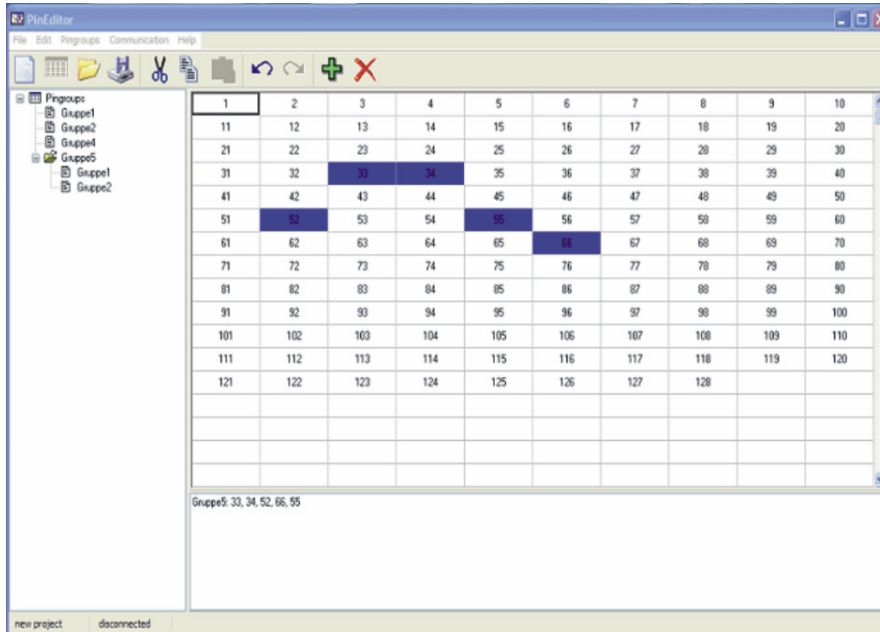
The TestEditor offers a graphic operator interface to establish test plans. Such test plans are comprised of various test sequences and sequence-dependent elements (loops, conditions ...).

A Test sequence is a combination between graphic interface and test sequence in form of a script that can be parameterized. The respective scope of functions of test sequence is defined in the test script.



Further to the establishment of test plans, new test sequences, scripts and operator interfaces may also be defined in the TestEditor to ease adaptation of test sequences to new demands at any time. Pre-defined test sequences adapted to the relevant testing job can be supplied for ease of access.

## PingroupEditor

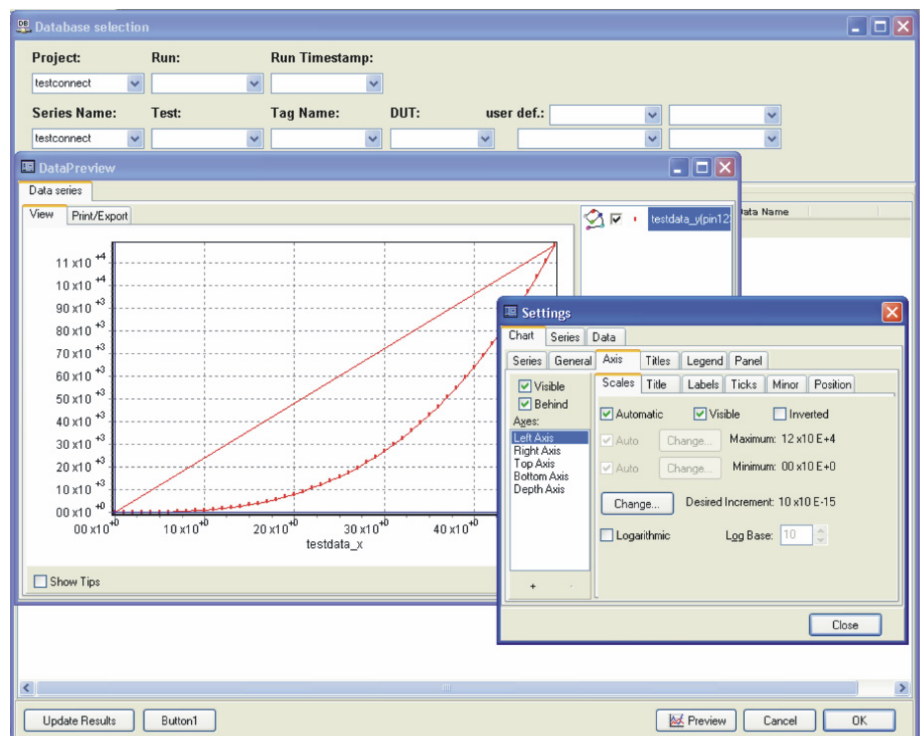


An assignment of meters to defined pins is necessary to test integral assemblies and circuits with a control matrix. The pins can be defined and grouped into Pingroups according to their function and type by means of the Pingroup-Editor.

Based upon an assignment specially configured for the test adapter applied, the pins are assigned to the matrix interface. This definition eases handling of component pins both in the TestEditor and the PatternEditor.

## ReportingTool

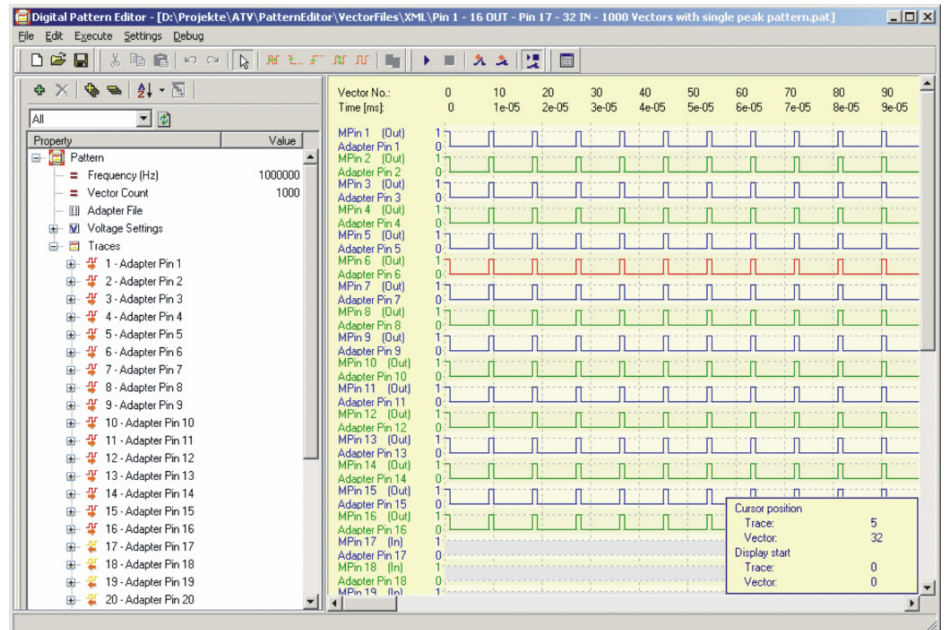
The generated data are evaluated and visualized in the ReportingTool. The data is read-out from the database and visualized according to user-specific demands. The following free-positioned graphic elements are available to configure the reports: texts, charts, and lines. Configured data presentations can be saved as screen and reused. Mathematic functions to edit the measured values are available both in the ReportingTool and the RTE. Comparative operations e.g. with setpoint curves (Golden Device) can already be declared during the test. Mathematic processing takes place in the test sequence directly on the RTE.



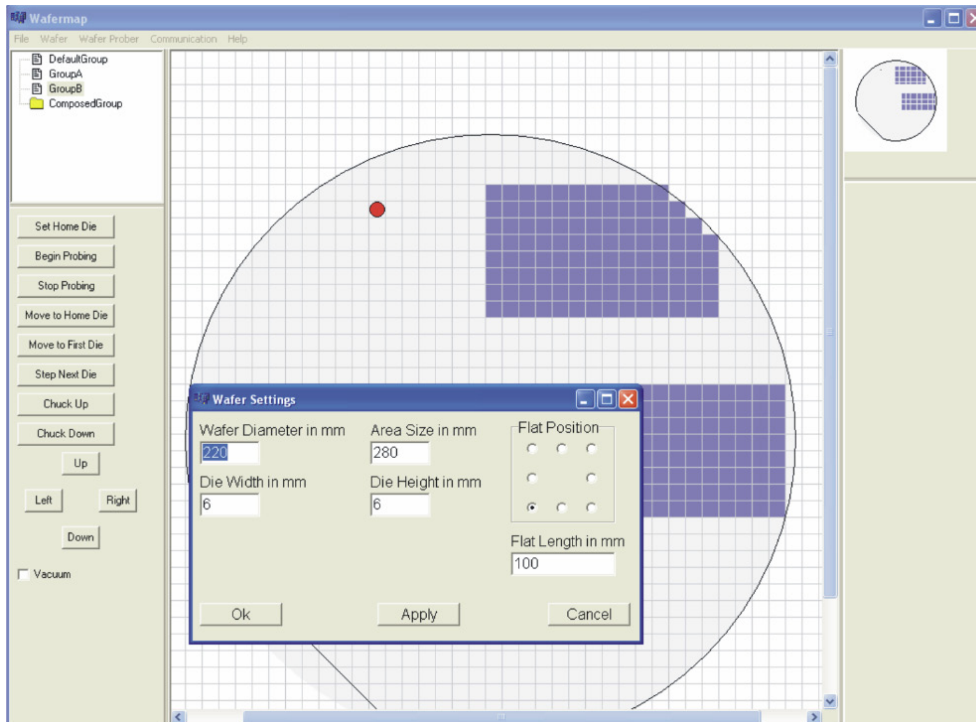
## PatternEditor

The PatternEditor is used for graphic description and evaluation of digital stimulation patterns (Pattern) for output to component and/or read-back signals of DUT.

The digital channels are configured to output and/or read-back of signals by means of the Pattern-Editor. The output signal may be varied as regards voltage adjustment (LOW and HIGH level) and frequency. During output, the data of read-back channels are acquired and visualized at the end of pattern output as a function of time.



## Wafermap



This program module is used to set-up and trigger prober systems. Groups of wafer structures (Dies) can be defined by means of the Wafermap and test cycles automatically run via wafer ranges.

## Technical Data

### Sources and Meters

#### Source:

Maximum output power:	30.6W ( $\pm 20.2V@1.515A$ / $\pm 202V@101mA$ ) current/voltage source with limitation 4-quadrant operation
Current source:	$\pm 1pA$ bis $\pm 10A$
Voltage source:	$\pm 10\mu V$ bis $\pm 200V$

#### Meter:

	5½ -digit multimeter for current/voltage sensing Remote Sense
Accuracy	0.03%
Communication interface port:	IEEE-488

### Control Matrix

Comprised of single matrix cards:	6 rows x 32 columns
Lifetime of switch contacts:	>108 no-load operations; >105 operations with ohmic load
Channel resistance:	<1 Ohm
Contact potential:	<4.5 $\mu V$ per contact pair
Insulation resistance:	>109 Ohm
Communication interface port:	IEEE-488

### TriggerController

Number of triggered sources:	16
Number of digital I/O channels:	16

### Digital Signal Pattern Generator

Signal memory:	up to 512MByte on board (16MByte default)
Output/input speed:	10kS/s - 1MS/s (higher speed on request)
Number of I/O-lines:	equal to pin number
Output Lines High-/Low voltage:	0 bis 10V (resolution 20mV)
Output Lines max. output current:	>50mA / pin, short-circuit-proof
Input Lines voltage threshold:	0 bis 10V (resolution 20mV)
Isolation to analog sources:	relay

### System Construction

Dimensions	standard width 19" rack WxHxD: 550x1250x780mm double-width rack WxHxD: 1100x1250x780mm
Weight:	approx.. 100kg (dependent on degree of extension)
Power absorbed:	approx.16A (dependent on degree of extension)
Integral PC:	IPC with WindowsXP
External interface ports:	IEEE-488, Ethernet RJ45, PS/2 (keyboard, mouse), USB, VGA-(screen monitor)

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