

REINHARDT

System- und Messelectronic GmbH

ATS-SMFT 780 Multi-Function Test System for Test of Electronic PCBs, Modules and Devices

In-circuit Test: max. 3,840 channels (not multiplex)

Function Test: analog, digital, microprocessor, power electronics, power supply test

Boundary Scan

with JTAG-programmer and graphical display of fault location

Display Evaluation

LCD, LED, dot, seven segm.

Bus Systems

Profibus, CAN-Bus, RS232-, RS485, SPI, I²C-interface, K-Bus, DeviceNet, LIN-Bus, VISA-Bus, Lon-Bus, EIB-Bus, TCP/IP, USB, GPIB/IEEE, ...



Software

Menu-driven programming in forms, APG and autolearn
graphical display of fault location
Integration of external programs, Flash, CAD-data import

Quality Management

Statistics, reference test, database connection, ODBC, package for system calibration and system diagnose

Fixturing

cost-effective manual and pneumatic test fixtures; bed-of-nails construction software; semi-automatic fixture production system

ATS-SMFT 780 In-circuit-Function Test System

Test Systems for Practitioners by Practitioners

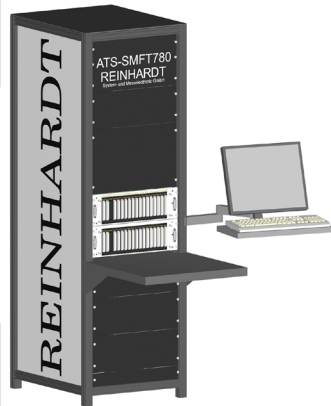
Founded in 1976 REINHARDT System- und Messelectronic GmbH has its own development department since 1977 and produces and sells automatic test systems. For many years REINHARDT has been offering the most comprehensive range of products for quality management in electronics production. Customers come from medium-sized companies, from very small firms to big companies. The test systems

are used in testing sensor electronics, in measuring and control engineering, automobile and communication electronics, controls, safety electronics in nuclear power plants, military products etc.

REINHARDT-products are being re-developed continuously and adapted to market requirements. Experiences of the well-versed development and service are incorporated.

ATS-SMFT 780 Hard- and Software Modules

Sources and Loads 4x 38 V, 1 mV 2 A/1 A, 50 μ A 6x \pm 40 V, \pm 15 V, \pm 5 V Fr. 1 MHz 25 Veff, 1 mV Electronic Load 0–5.1 A	DEC 670 Multifunction 300 Hz–1.25 MHz 56 kHz–1.0 MHz 500 mA 480 MHz 1.8–5 V to 10 MHz 0.8 s–50 ns to 10 MHz 300 Hz–1.25 MHz 2 A 60 W 100 V 16 Bit 1.8–5 V	Meas. Unit ICT-Function ICT Meas. Unit DC-AC Meas. Unit Time-Frequency Meas. Unit Transient recorder	MMX 670 Stimul. matrix 48 channels in 12 busses 2 A expandable to 384 channels 2 4Quadrant PSUs 0 to +38 V 0 to -38 V max. 500 mA resolution U 1 mV I 10 μ A	RMX 96 Meas. Matrix 3Wire techn. expandable to 1,152 (3,840) In-circuit- and function test channels max. 0.5 A, 100 V, 10 VA	Monitoring Monitoring for stimulus sources	VMX 8 Meas. Matrix 8 Meas. chan. 420 V 0–400 Hz with pre-scaler and buffer amplifier	LOG 670 Logic Board 32 bi-directional channels expandable to 256 channels logic board 0–30 V prog. 10 mV	LOG 96 Logic Board 96 bi-directional channels expandable to 256 channels logic board for 3.3 V / 5 V	RML32 Meas. Logic-Stim. 32 Meas. chan. 24 channels stimulus matrix 2 A 32 Logic channels
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- In-circuit-/Function test software
- Graphic display of fault location
- Software for processing Gerber data
- Software for finding SMT solder defects
- Software for discerning Elcap-polarity Elcap
- Quality management
- Statistics software
- CAD-interface
- ODBC interface
- Offline repair station
- Offline programming station
- Boundary Scan
- ODT Optical Display Test
- Fieldbus, CAN, Profi, LAN, GPIB...
- Function arbitrary generator
- Power electronics up to 300 VDC, 40 ADC
- Fixture production system
- Test fixtures and modules

Legend: ● : Standard ○ : Option

MMX 72 Stimulus Matrix 72 channels in 18 busses 2 A expandable to 576 channels	EMX 48 Stimulus Matrix 48 normally open contacts, 230 V, 2 A expandable to 384 channels	NGS 3Fold PSUs 0–8 V, 0–4 A Programmable 2 mV 1 mA 0–38 V, 0–1 A Programmable 10 mV 0.25 mA 0–38 V, 0–1 A Programmable 10 mV 0.25 mA	PML 670 Pre.Logic Board 16 channels can be programmed individually 0–30 V resol. 500 μ V for driver and comparator max. 50 mA	TRA 670 Transient Recorder Transient recorder 50 MHz sample rate 250 MHz 8 HF 50 Ω channels 9 1 M Ω chan. res. 250 μ V all meas. channels can be evaluated auto. envelope curve	AC 670 AC/DC-Source AC-source, frequency variable 35 Hz–6.5 kHz 0.1 Hz-steps quartz exact 0 to 280 V 40 W, 12 bit resolution DC-source 0–350 V 0–100 mA res. voltage current 12 bit	LMX 670-8 Power Matrix 420 V, 20 A, 4000 VA 8 meas. channels 420 V 0–400 Hz with pre-scaler and buffer amplifier	Motor Trimmer R-Decade Mechanical adjustment of potentiometers "0"-adjustment max./min./des. value, right/left stop Resistances 1 to 16.7 M Ω in 1 Ω -steps + E-series	HSM 670 HV Stim. Matrix 16 channels 250 V AC-DC 10 A expandable to 64 channels	PMX 16 Power Matrix 16 channels 100 VDC 70 V ACeff max. 4 channels with 10 A parallel 1,000 W switch. power, max. 64 channels
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ATS-SMFT 780 is a combined In-circuit-Function tester. Expansions are grey.

REINHARDT-test systems can be calibrated, there is system responsibility as well as qualified service by the developer even 15 years after delivery.

REINHARDT Recipe for Success

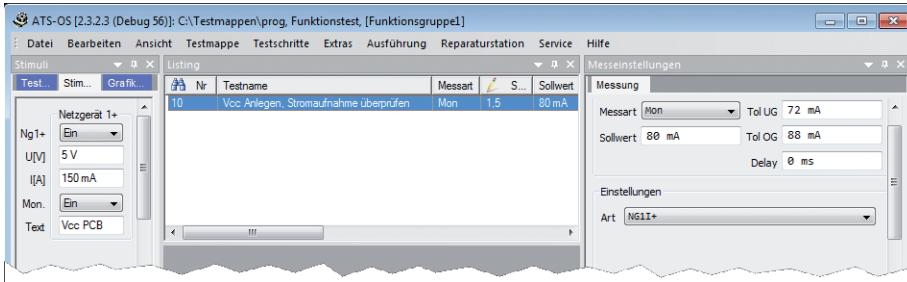
REINHARDT follows the philosophy of its founder, an excellent hardware developer who never wanted to occupy himself intensively with programming in a highlevel language. This is why he wanted the function test of his own test system to be programmed in a windows technique: An executable test program for the electronics PCB is created by filling in fields in a form. For each stimulus and measuring task, a window/form is filled in and every single step of the test program can be executed immediately. When the necessary single test steps with stimuli and measurements are prepared, the created test program is executed in some kind of batch

processing without any compilation. When the programmer of the test program understands the DUT in its function and knows how it is supplied, stimulated and addressed, he can create a test program for the electronic PCB although he does not know any programming language. Only 1–2 days are required for instruction.

Analysing the Testability of a Device under Test:

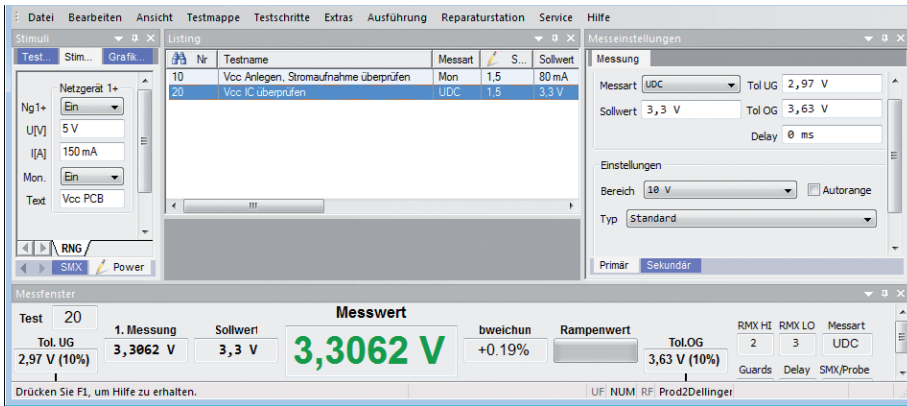
With a software-tool and the CAD and Gerber files of the PCB you can analyse in about a quarter of an hour if this PCB has been designed for Design for Testability and with which efforts it can be contacted for the in-circuit test via a bed-of-nails. It will show exactly which components cannot or can only be tested in an unsatisfactory way. The drilling data for creating your fixture are also generated with this tool.

Procedure Test Program Creation



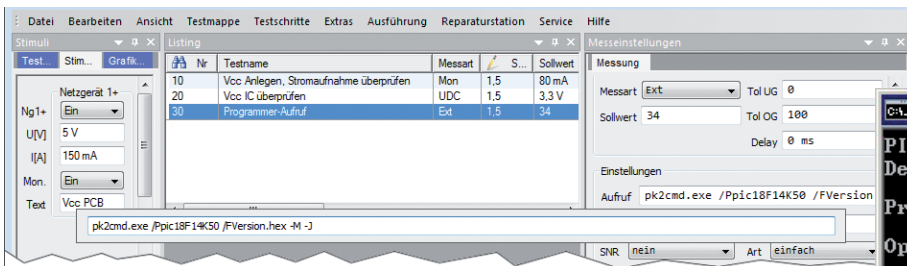
1st Test Step: Supply

Supply the DUT with 5 VDC, current limitation 150 mA, (PSU1 of the test system, in the left part of the form, check of current consumption (desired value 80 mA, lower limit 72 mA, upper limit 88 mA)



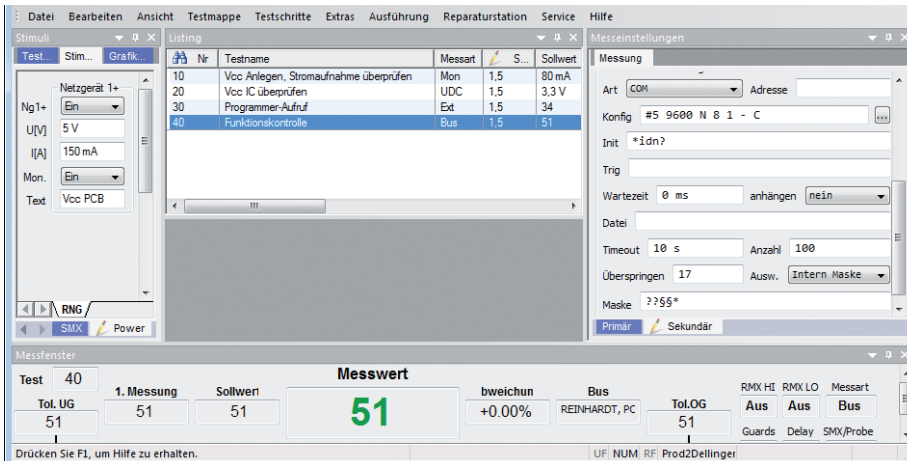
2nd Test Step: DC-Measurement

After duplicating the 1st test step, the DC-DC-transformer of the DUT is checked if the 3.3 V are available, with the resp. upper and lower limit. This single test step can also be executed immediately, as can be seen in the "MeasVal" field (3.3062 V). For further test steps only the measuring mode must be changed and of course the measuring channel of the test system. With a mouse click, you can also select the measuring channel graphically with the help of the CAD-data.



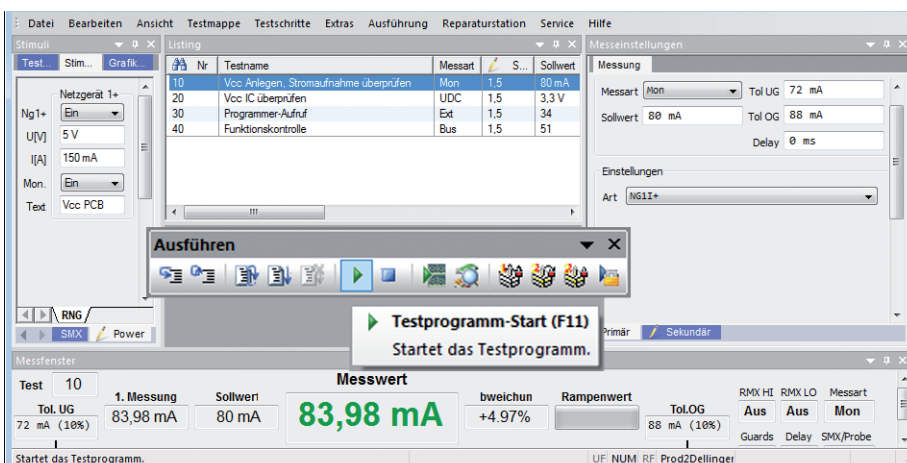
3rd Tests Step: EXE-Program

An executable EXE-program activates the programmer with transfer parameters for flashing the microprocessor



4th Test Step: Fieldbus

In this form the DUT is stimulated and evaluated via RS232-interface. Evaluation is with a numerical value (51) and in this example is done via wild card. Needless to say, other fieldbusses can be used, e.g. CAN-Bus, I²C, Profibus, ...



Execution Test Program:

In our example, 4 test steps were created for the function test; the complete test program starts by either activating the "Start Testprogram" button in the toolbar or by the F11-key. Compilation is unnecessary but the batch processing can start at once.

The REINHARDT-In-circuit test is unique in that the bed-of-nails fixture need not be wired individually but can be wired freely. The designation which measuring channel of the test system is wired to which contact pin is guided graphically with the support of a search probe. For about 400 contact pins, this takes typically 20 minutes incl. verification, i.e. an enormous time saving and low cost.

The **In-circuit test** recognises solder defects which end in either short-circuits or breaks (cold joint) or open pins if SMT components are used. There is a special measuring method which, although programming is easy, finds even SMT-solder defects of fine-pitch ICs, BGAs. Components such as IC-insertion and resistors, capacitors, diodes, Zener diodes, FETs, operational amplifiers etc. are tested for values and polarity. Programming data can be transferred from CAD-data. As there is an automatic program generator, the test program is generated in typically 4 minutes per 100 components.

In both In-circuit and Function test, you just click on the resp. component pin in the graphical display in order to display the test system measuring channel.

With the **RUDC 10 CAD-interface** it is possible to quickly create a test program. From Gencad or assembly lists it creates the component test semi-automatically. There is also a matching with the Gerber data so that the component channels can be determined automatically. It is also possible to generate Gerber data with net information out of EAGLE-data and a BOM (Bill of Materials) which can be imported.

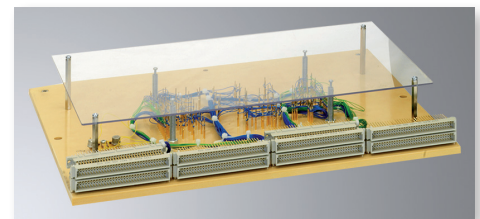
The **Function test** is divided in analog, digital, microprocessor-, power electronics and power supply test. The modules are developed and produced in the latest technologies and in the best possible way designed for high speed test and for reliability in a three-shift operation.

The basic unit holds 6 **DC-voltage sources** with 16 bit resolution which can be programmed independently from one another and 6 **fixed voltage sources**. PSU 1+2 (+) 0 to +38V 1 mV, max. 2 A (50 μ A), PSU 1+2 (-) 0 to -38V, 1 mV max. 1 A (50 μ A), MNG-PSU 1 0 to +38V 1 mV, 0.01% 500mA, 10 μ A, 0.1% and MNG-PSU 2 0 to +38V 1 mV, 0.01% 500mA, 10 μ A, 0.1. Further programmable sources are options. A potentialfree **electronic load** (max. 65W, 0 to 5.1 A step 100 μ A, OVP programmable, 5 to 100 V, 1 V step) is also part of the basic version.

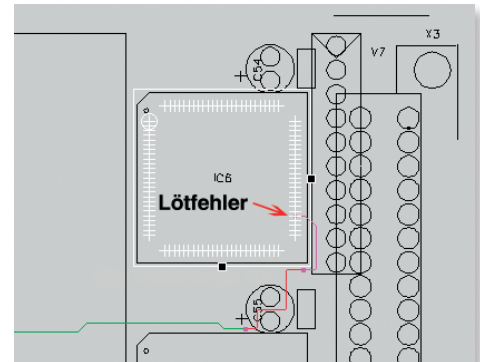
The **Sine-Square Wave Generator** can be programmed from 0 Hz to 1 MHz (3dB limit, 500kHz). Maximum voltage is 25 V_{eff} (sine) or 0–25 V_{pk} (square wave) with a pulse duty factor from 10–90%, maximum current is 1 A. Current limitation of the sine and square wave generator can be programmed. The offset voltage can be programmed with 10 mV resolution. A **pulse generator** can be programmed from 0.6 Hz to 10 MHz, its pulse width from 0.8 s to 50 ns and its amplitude from 1.8 to 5 V.

Optional **Function and Arbitrary Generators** for frequencies up to 20/80 MHz offer sine, square wave, triangle, sawtooth, noise, pulse signals, ramps as well as arbitrary functions.

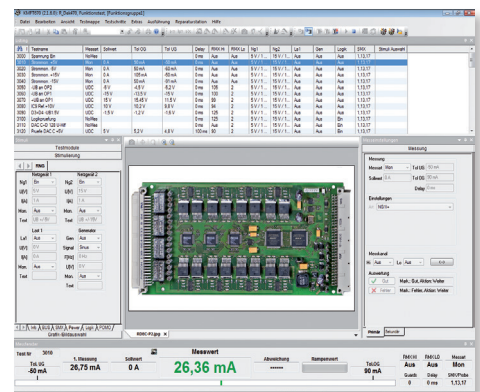
The **RMX 96 Measuring Matrix** is used for measuring tasks in the in-circuit or in the function measuring range. There are 480 measuring channels in relay technique. Expansion is in groups of 96 up to 2,400 channels (or 3,840 channels with another rack). For guarding the matrix is made up in three bus technique.



wired exchange plate



Pin-exact graphical display of fault location



Programming PSUs in the function test form

The **VMX 8 High Voltage Measuring Matrix** can handle up to 420 V in contrast to only 100 V in the classical Reed-Relay technique. Function test under mains voltage is possible then. 8 channels per board.

The **MMX670 Stimulus Matrix** offers 48 channels in 12 bus systems, the optional MMX72 offers 72 channels in 18 bus systems in one-wire technique for 2 A maximum current.

The 16 bit **Measuring System for In-circuit and Functional Test** measures DC, AC, True RMS up to 100 kHz, peak, current, AC current, resistance, resistance four-terminal, frequencies, periods, pulse widths, rise and fall times, phases, pulse duty factor, results, intervals between 2 channels, transient recorder, distortion factor and Fourier analysis.

The 64 k deep **Transient Recorder** (Oscilloscope, 50 MHz, resolution 12 bit) has got 250 MHz max. sample rate and 250 μ V minimum resolution. Out of the curve forms it measures parameters such as frequency, rise time, fall time, pulse width, peak voltage, distortion factor, Fourier analysis etc.

Power electronics provide operating voltages and currents above the standard voltage supplies of ATS-MFT 770. A number of sources for DC-voltage (up to 300 VDC and 40 ADC), AC-voltage and electronic loads (up to 40 A) are available.

There is an **AC-Voltage Source** which can be programmed in frequency and voltage from 0–280 V/42 W, DC-source 0–350 VDC, 100 mA. Further power voltage sources are 0–300 V/500 W, 0–300 V/800 W and 0–300 V/1,000 W.

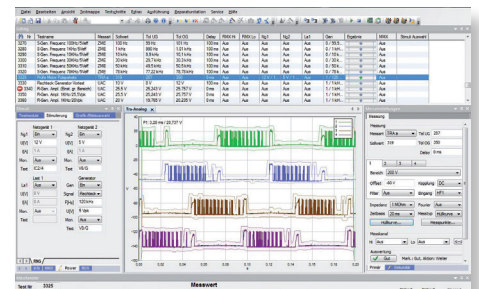
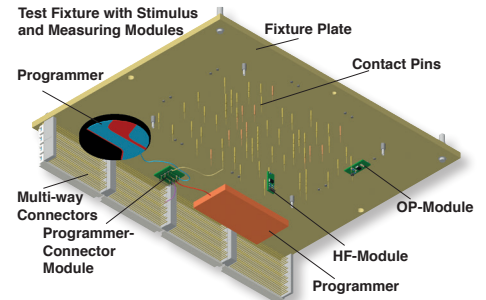
For switching high currents and voltages, there is the optional **LMX670 Power Matrix** with 8 normally open contacts and high-voltage measuring matrix channels, maximum voltage: 400 V, maximum current 16 A and the **PMX 16 Power Matrix** with 16 channels for switching high DC-currents with 1,000 W (DC max. 100 V, 10 A) max. switching power.

The **HSM 670 High Voltage Stimulus Matrix** with 16 channels is for switching stimulus signals up to DC 250 V (max. 10 A, 300 W) and AC max. 250 V, max. 10 A, max. 2,500 W.

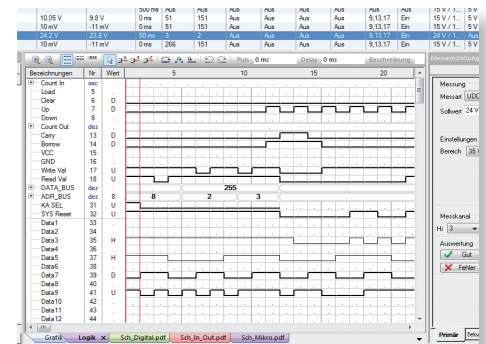
The **Logic Board** (32 channels, max. 256 channels) stimulates and measures logic conditions. Logic is tested with the bi-directional drivers between 0 V and 30 V. With several logic boards, you can stimulate and evaluate several logic families such as 0.8 V, 1.5 V, 3.3 V, 5 V, 24 V-logic up to 28 V-logic at the same time.

The **PML 670 HighSpeed-Measuring System, Precision-DC-Source and Logic** combines the function of a parallel DC-voltage measuring unit (16 channels 0–30 V, 0.5 mV resolution) with a 16fold DC-source (max. 50 mA) and is also used for stimulating and measuring logic conditions. Each of the 16 channels can be programmed individually from step to step in the driver and comparator levels; each channel can be programmed with different levels with 0.5 mV resolution.

There are various hard and software interface modules for easy integration in an **Inline** production line.



4 Transient recorders, cascadable, curve forms can be evaluated, among others via envelope curves



Programming Logic

The RBS 100 **REINHARDT-Boundary Scan** test and editing module for REINHARDT-test systems is fully integrated in the test system menu. With the standard logic channels, it can test components which are not accessible via Boundary Scan cells, e.g. interface pins. Convenient programming via Boundary Scan e.g. of Analog-to-Digital converters is also possible. When you create the test program, you need the Gerber files and the BSDI-data of the ICs. They are required for the graphical display of fault location and the connections of the ICs. There is no cryptical display.

With the **Statistics Software** all test results needed for quality management are recorded as is the good or bad status of the test item. For assessing histograms of test steps, you can check all measured values.

The optional **ODBC-Interface** helps to integrate the REINHARDT-test system in an existing quality management or in production procedures with data base management.

Fixtures for a device under test are very important in automatic testing. REINHARDT is the only manufacturer of test systems who produces test fixtures as well. If you have to change your fixture for another PCB, you only change the fixture drawer (bed of nails) and the universal retention system. This takes only a few seconds.

Building Fixtures and Creating Graphs of Fault Location

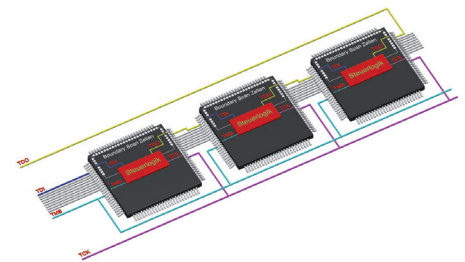
From the Gerber data, the graphical data for fault location are generated and the positions for the spring contact pins are computed. The carrier plate (exchange plate) for contact pins and reference pins is drilled with the created drill file. The insertion tool automatically places the contact pins (100 mil and 75 mil) with receptacles into the drilled positions. Accuracy in drilling and placing is better than 10–20µm. The magazines can hold different types of heads. In typically 3 to 5 hours test fixtures are drilled, the pins placed and wired with wire-wrap or via plug-in cables. Fixtures are built in an extremely cost-effective way, just-in-time and at your own site. With two to three fixtures a year, the investment will be repaid within one year.

Some of the listed modules are options and do not come with the basic version.

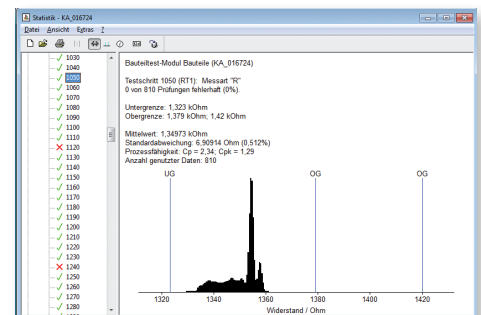
For more detailed information, please see our homepage on the internet under <http://www.reinhardt-testsystem.de> or contact us for more detailed brochures.

E & OE – Specifications subject to change without prior notice.

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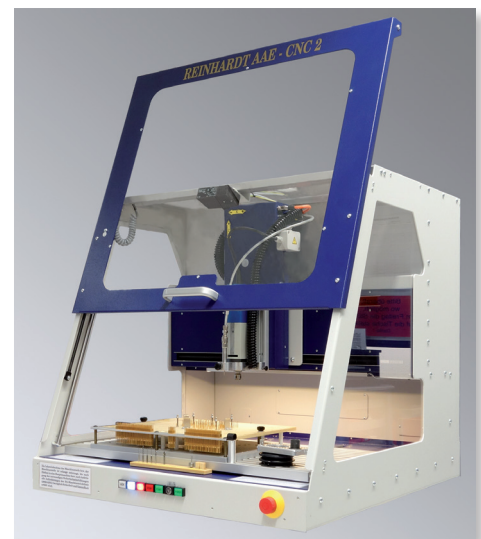
Boundary Scan Test



Statistics – Histogram



Fixture Type 42A-2, pressure force 2,000 N, working area 360 x 230 mm



Fixture Production System