REINHARDT
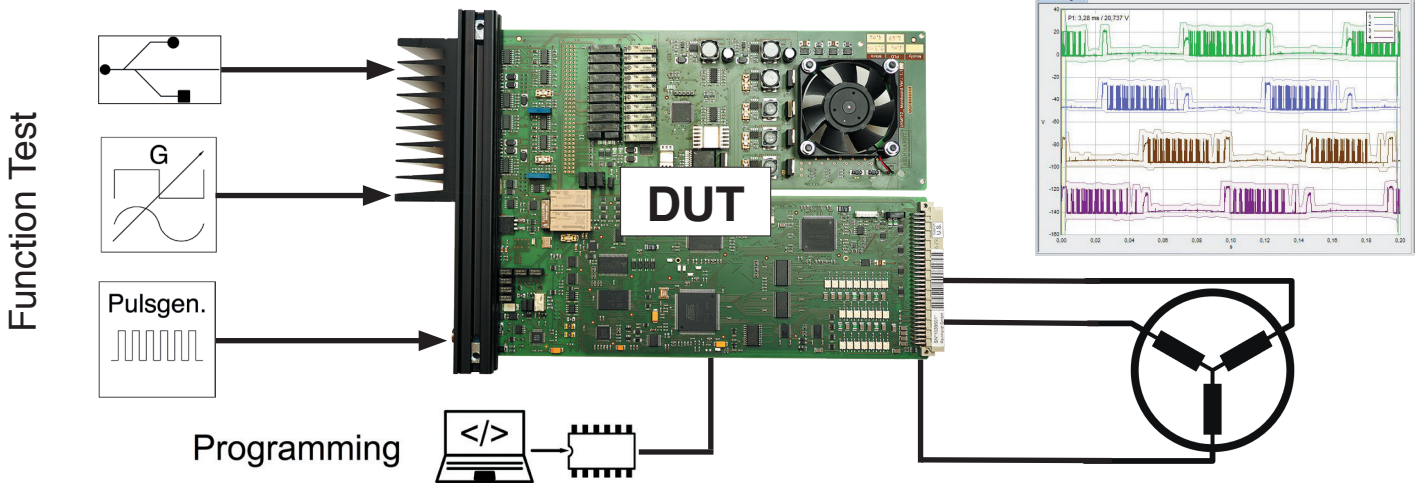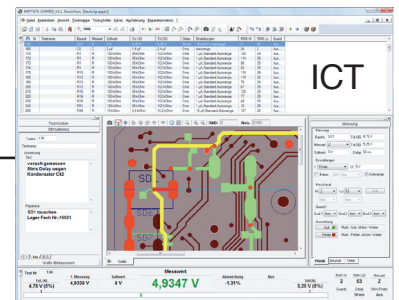## System- und Messelectronic GmbH

ATS-MFT 770 Multi-Function Test System
for Test of Electronic PCBs, Modules and Devices

ATS-MFT 770

ICT

Daten-bank

Function Test

DUT

Programming

Automatic Test System for

➢ Function test, In-Circuit Test (4,320 channels), Boundary Scan Test, Power Electronics, Inline, EOL-Test

➢ the electronic manufacturing industry, incoming inspection test, repair and development

➢ the series test of electronic PCBs, designed for small batches up to high-volume products

➢ Automotive, medical engineering, avionics, power producing industry, defence and military technology, environmental technology, housing technology, white and brown goods,…

Some Features

➢ On-board programming

➢ RBS100 REINHARDT-Boundary Scan

➢ USB-, RS232-, RS485-, I^2C-interface, CAN, Profibus, GPIB, TCP/IP,… some of them optional

➢ Parallel test (RST 40)

➢ Windows programming, APG and auto learn

➢ Automatic debugging and optimisation

➢ CAD-interface RUDC10

➢ Statistics and fault evaluation, QS-Management

➢ Automatic creation of a test report

➢ BIST and Package for system calibration

ATS-MFT 770M-1/B Hard- and Software Modules

Sources and Loads	DEC 670 Multifunction	Meas. Unit ICT-Function	MMX 670 Stimul. matrix	RMX 96 Meas. Matrix	Monitoring	VMX 8 Meas. Matrix	LOG 670 Logic Board	LOG 96 Logic Board	RML32 Meas. Logic-Stim.
4x 38 V, 1 mV 2 A/1 A, 50 µA; 6x ±40 V, ±15 V, ±5 V; Fr. 1 MHz 25 Veff, 1 mV; Electronic Load 0–5.1 A	2 RS 232 300 Hz–1.25 MHz; 2 I²C 56 kHz–1.0 MHz; 1 USB 500 mA 480 MHz; 1 SPI 1.8–5 V to 10 MHz; Pulsgen. 0.8 s–50 ns to 10 MHz; 1 RS 485 300 Hz–1.25 MHz; 3 X RL 2 A 60 W 100 V; 2 8 SPS 16 Bit 1.8–5 V	ICT Meas. Unit; DC-AC Meas. Unit; Time-Frequency Meas. Unit; Transient recorder	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 µA	3Wire techn. expandable to 1,440 (4,320) In-circuit- and function test channels max. 0.5 A, 100 V, 10 VA	32; Monitoring for stimulus sources	8 Meas. chan. 420 V 0–400 Hz with pre-scaler and buffer amplifier	32 bi-directional channels expandable to 256 channels; logic board 0–30 V prog. 10 mV	96 bi-directional channels expandable to 256 channels; logic board for 3.3 V / 5 V	32 Meas. chan.; 24 channels stimulus matrix 2 A; 32 Logic channels

- ● In-circuit-/Function test software
- ● Graphic display of fault location
- ● Software for processing Gerber data
- ● Quality management – statistics software
- ○ ODBC-Schnittstelle
- ○ CAD-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	EMX 48 Stimulus Matrix	NGS 3Fold PSUs	PML 670 Pre.Logic Board	TRA 670 Transient Recorder	AC 670 AC/DC-Source	LMX 670-8 Power Matrix	Motor Trimmer R-Decade	HSM 670 HV Stim. Matrix	PMX 16 Power Matrix
72 channels in 18 busses 2 A expandable to 576 channels	48 normally open contacts, 230 V, 2 A expandable to 384 channels	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	16 channels can be programmed individually 0–30 V resol. 500 µV for driver and comparator max. 50 mA	Transient recorder 50 MHz sample rate 250 MHz 8 HF 50 Ω channels 9 1 MΩ chan. res. 250 µV all meas. channels can be evaluated auto. envelope curve	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	420 V, 20 A, 4000 VA 8 meas. channels 420 V 0–400 Hz with pre-scaler and buffer amplifier	Mechanical adjustment of potentiometers "0"-adjustment max./min./des. value, right/left stop; Resistances 1 to 16.7 MΩ in 1 Ω-steps + E-series	16 channels 250 V AC-DC 10 A expandable to 64 channels	16 channels 100 VDC 70 V ACeff max. 4 channels with 10 A parallel 1,000 W switch. power, max. 64 channels

ATS-MFT 770M-1/B is a combined In-circuit-Function tester. Expansions are grey.

REINHARDT-Test systems are based on empirical values made in more than 4 decades. Hard- and software come from a single source; needless to say, there is systems responsibility and qualified service by the developers.

Its low price, its comfortable menu-driven software, its low follow-up cost in fixturing, in programming and maintenance create economical test solutions even for smallest series (5 to 500 units) as well as for high-volume series.

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.

The REINHARDT-In-circuit test is unique in that the bed-of-nails fixture need not be wired indivdually 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.

Procedure Test Program Creation
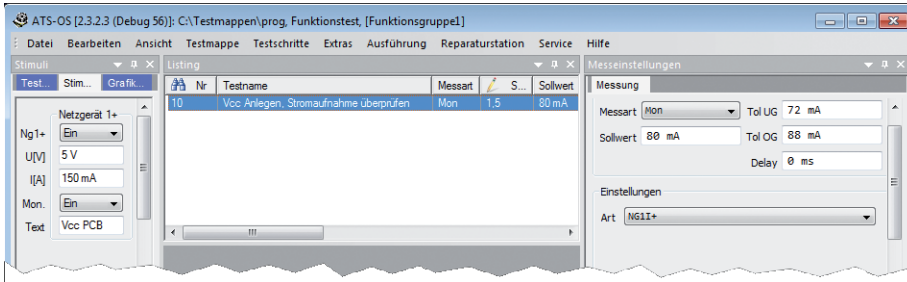
1st Test Step: Supply
Supply the DUT with 5 VDC, current limitation 150 mA, (PSU1 of the test system, in the left part of the form, check of current consumption (desired value 80 mA, lower limit 72 mA, upper limit 88 mA)
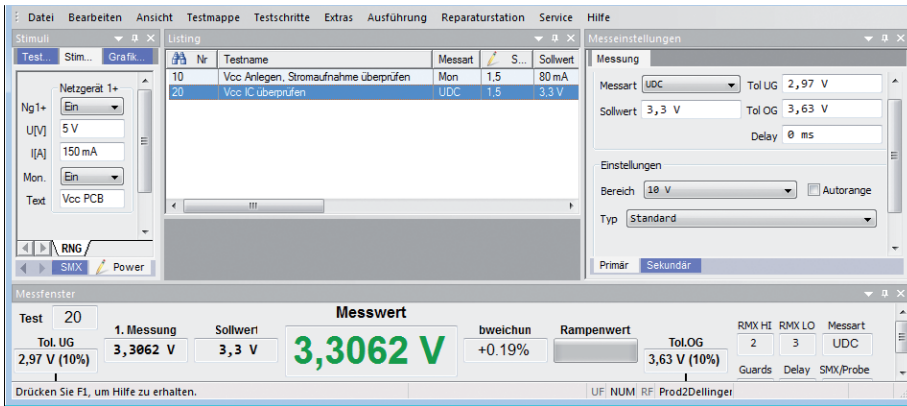

2nd Test Step: DC-Measurement
After duplicating the 1st test step, the DC-DC-transformer of the DUT is checked if the 3.3 V are available, with the resp. upper and lower limit. This single test step can also be executed immediately, as can be seen in the "MeasVal" field (3.3062 V). For further test steps 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.
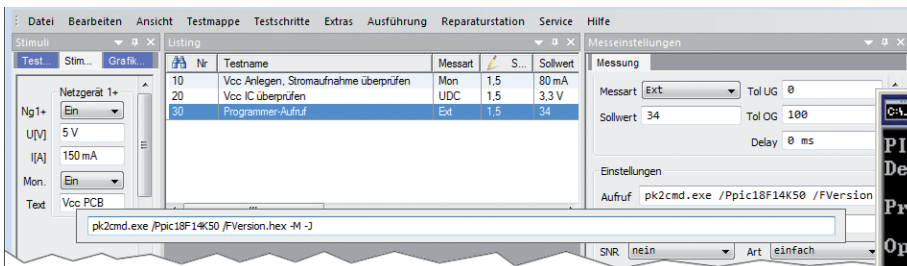

3rd Tests Step: EXE-Program
An executable EXE-program activates the programmer with transfer parameters for flashing the microprocessor
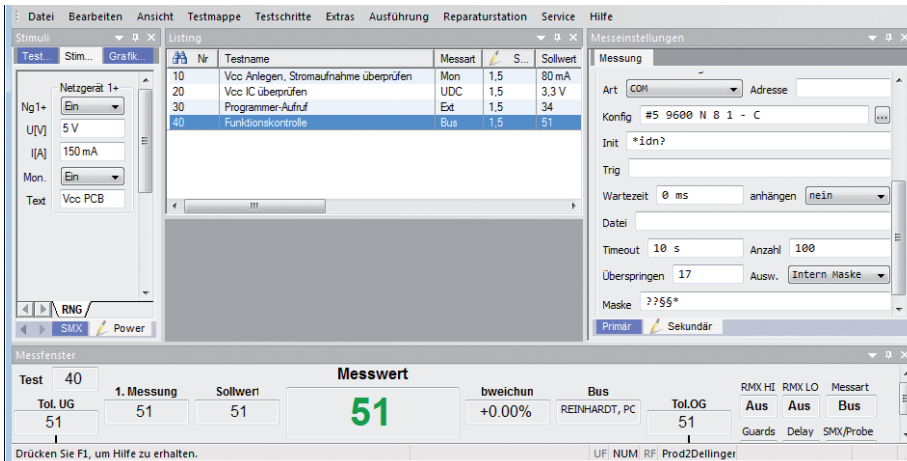
4th Test Step: Fieldbus
In this form the DUT is stimulated and evaluated via RS232-interface. Evaluation is with a numerical value (51) and in this example is done via wild card. Needless to say, other fieldbusses can be used, e.g. CAN-Bus, I²C, Profibus, …
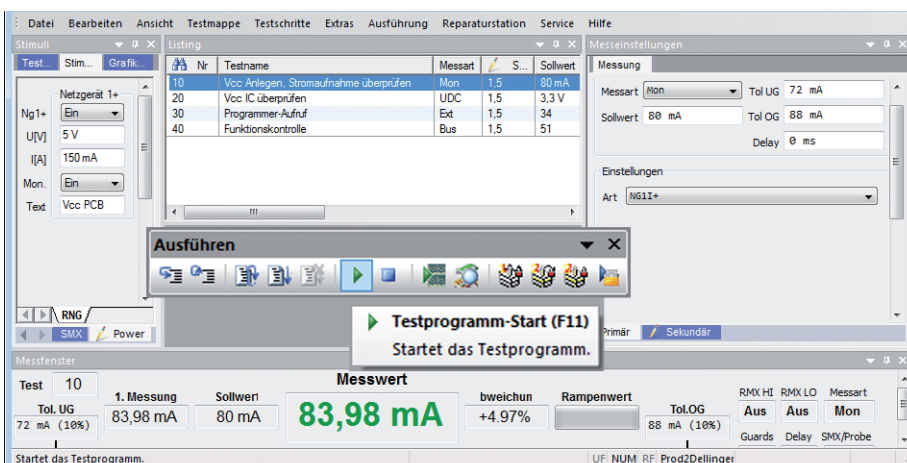
Execution Test Program:
In our example, 4 test steps were created for the function test; the complete test program starts by either activating the "Start Testprogram" button in the toolbar or by the F11-key. Compilation is unnecessary but the batch processing can start at once.

Programming REINHARDT-Test Systems

CAD-import, menu forms and automatic program generators (APG) reduce inputs to a minimum. The created test step can be tested immediately with the DUT.

Programming is done in menu forms so that programs are created rapidly and can be expanded, modified, corrected or optimised, even by trainees.

wired exchange plate

The **In-circuit test** recognises solder defects such as short-circuits or breaks (cold joint) or open pins. A special measuring method even finds 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 (matching net names via IPC-D-356-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.

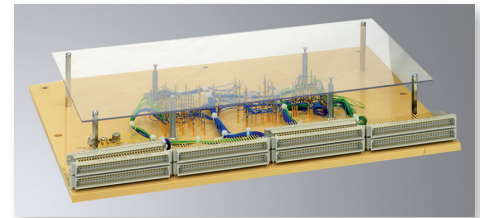*Pin-exact graphical display of fault location*

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 +38 V 1 mV, max. 2 A (50 μA), PSU 1+2 (-) 0 to -38 V, 1 mV max. 1 A (50 μA), MNG-PSU 1 0 to +38 V 1 mV, 0.01 % 500 mA, 10 μA, 0.1 % and MNG-PSU 2 0 to +38 V 1 mV, 0.01 % 500 mA, 10 μA, 0.1. Further programmable sources are options. A potentialfree **electronic load** (max. 65 W, 0 to 5.1 A step 100 μA, OVP programmable, 5 to 100 V, 1 V step) is also part of the basic version.
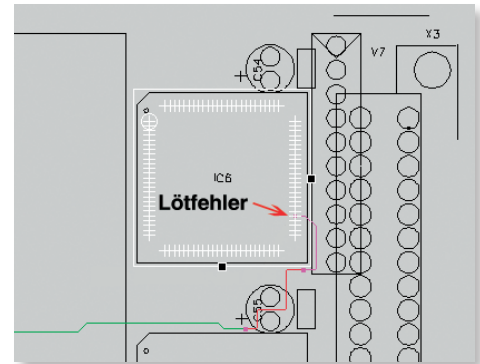
The **Sine-Square Wave Generator** can be programmmed from 0 Hz to 1 MHz (3 dB limit, 500 kHz). Maximum voltage is 25 V$_{eff}$ (sine) or 0–25 V$_{pk}$ (square wave) with a pulse duty factor from 10–90 %, maximum current is 1 A. Current limitation of the sine and square wave generator can be programmed. 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.

Programming PSUs in the function test form

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.
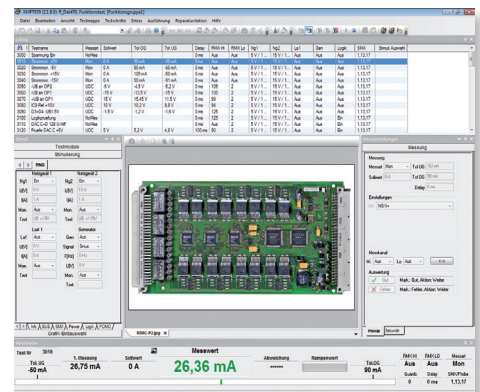
The **RMX 96 Measuring Matrix** is used for measuring tasks in the in-circuit or in the function measuring range. There are 96 measuring channels in relay technique. Expansion is in groups of 96 up to 1,440 channels (or 4,320 channels with further racks). For guarding the matrix is made up in three bus technique.
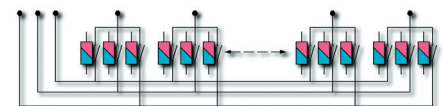
The optional **VMX 8 High Voltage Measuring Matrix** can handle up to 420 V in contrast to only 100 V in the classical Reed-Relay technique. Function test under mains voltage is possible then. 8 channels per board.

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 μV 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.

Test Fixture with Stimulus and Measuring Modules
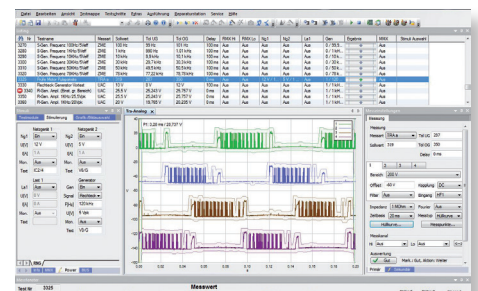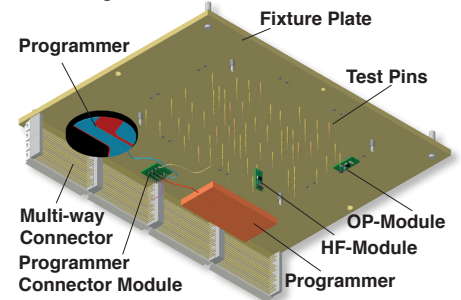
4 Transient recorders, cascadable, curve forms can be evaluated, among others via envelope curves

Programming Logic

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

Boundary Scan Test

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 BSDL-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.

Statistics – Histogram

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.

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

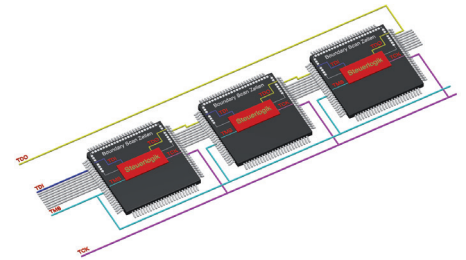### Building Fixtures and Creating Graphs of Fault Location

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 10–20 μm. 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.

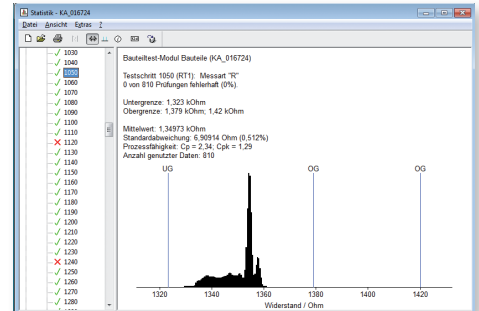*Some of the listed modules are options and do not come with the basic version.*

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

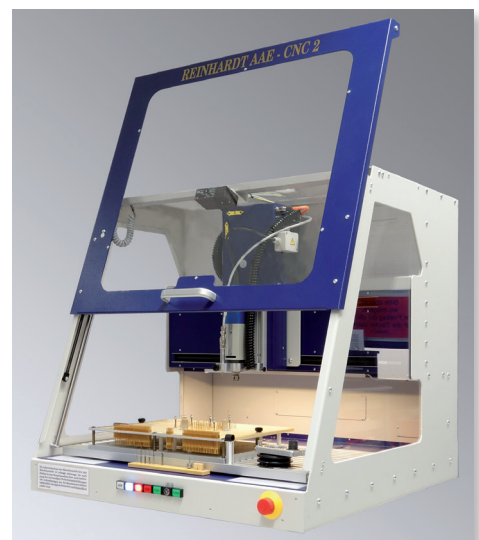*E & OE – Specifications subject to change without prior notice.*   10/2023

Fixture Production System