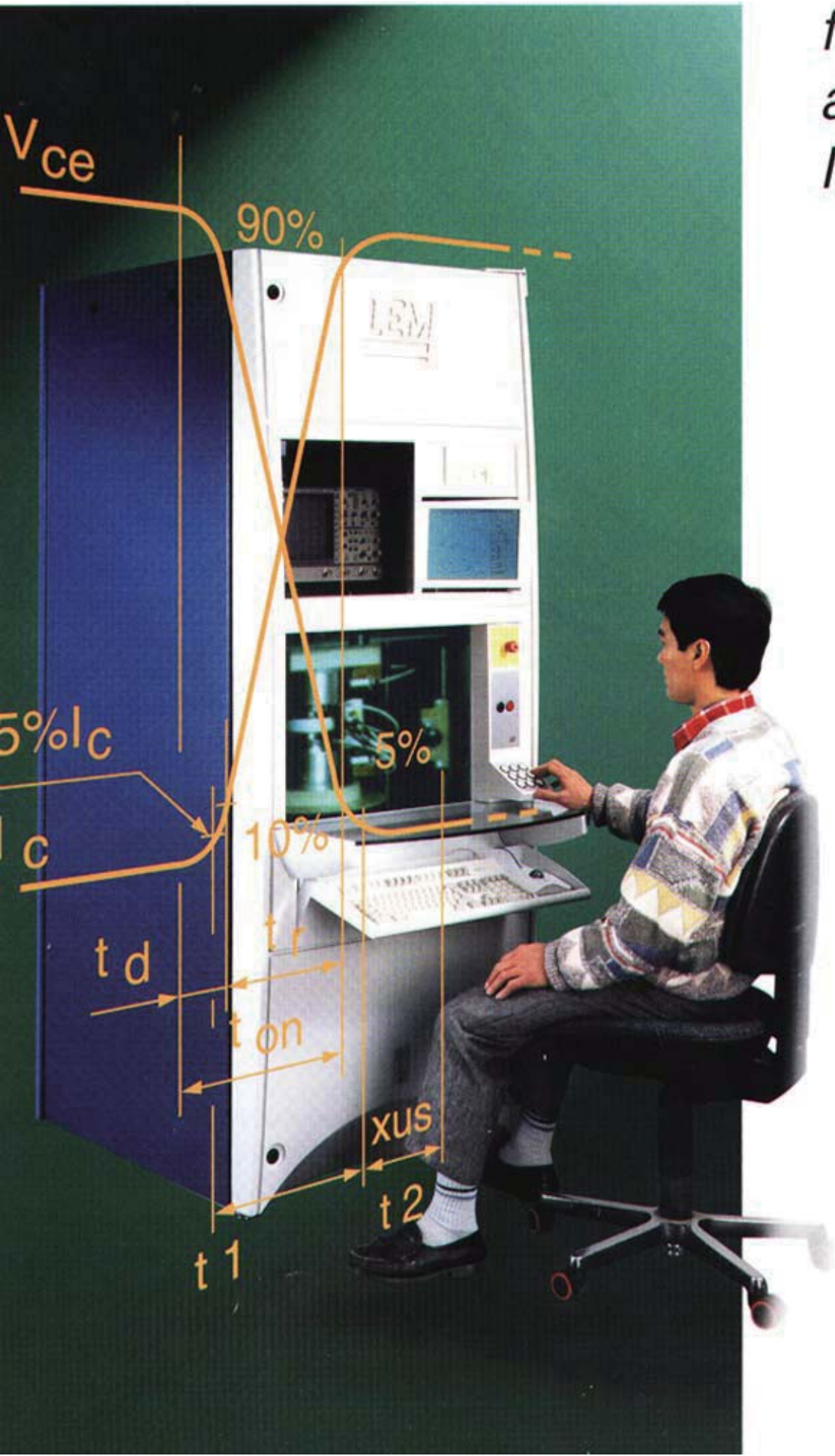
Flexible Test System

for IGBTs and MOSFETs



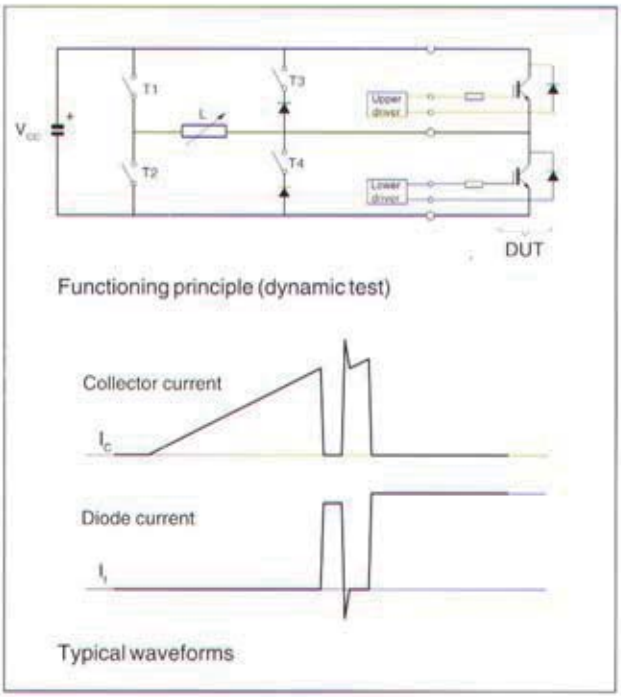
LEMSYS

Flexible System Concept

Many issues must be considered when evaluating the market for new test equipment. Development engineers need high accuracy characterisation for their designs, production managers require fast and easy to use tools for process control, and those responsible for quality need to collate and display large volume of test data for statistical analysis. Just as importantly, the test equipement chosen must be able to keep up with new technology trends by being simple and cost effective to upgrade. To address all these requirements LEM have designed both software and hardware modules which provide total flexibility to our range of test systems.

Simulation of Applications

The first benefit brought by the open architecture of the LEM design is the ability to test products closer to their normal working conditions. For most IGBT users, testing means more than firing a power pulse through a single transistor and reading off results. They are interested in the behaviour of these components within the total design. For this reason we have integrated into our equipment the ability to measure switching characteristics on half-bridge modules. In this configuration, the current flows through the inductive load and the DUT (device under test) - switch settings make it possible to simultaneously measure one of the IGBT (or MOSFET) devices together with the freewheel diode of the other leg of the half-bridge. The timing for operating the switches and the gate drives is defined to generate two current pulses in the collector of the device to be tested. The di/dt in the freewheel diode is generated by the IGBT or MOSFET itself, as it would be in the application. The generated waveforms thereby simulate perfectly what normally happens in the real life application. To stay consistent with real designs also, all internal connections between power modules are made with busbars of minimum length, keeping the stray inductance below 30 nH. Testing either single or double components is fast, and can performed for either characterisation, production or final inspection purposes. There is no special set-up to be performed on the equipment, all these features are inherent.



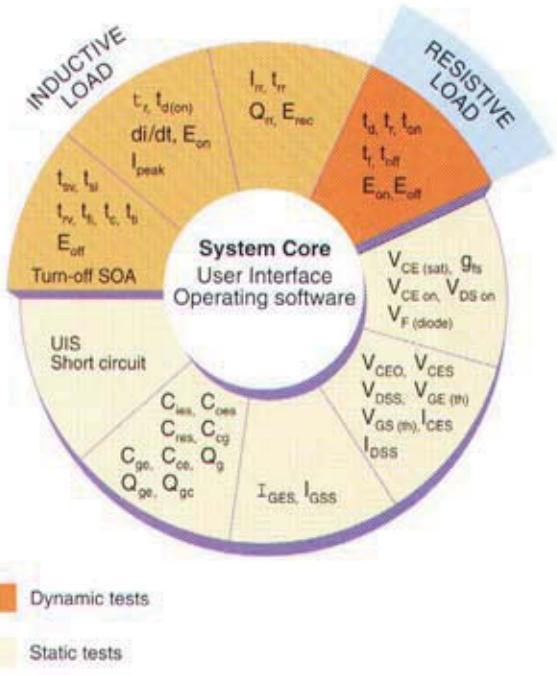
Functioning principle (dynamic test)

Typical waveforms

Test parameters

The system can be fitted with static (DC) and switching (AC) measurements on both resistive and inductive loads, including gate characteristics. The accuracy of the measurements has been improved for better product quality analysis. The key elements are a state of the art digital oscilloscope, linked to specially designed current and voltage probes. They provide our test system with a great advantage for the measurement of one very important parameter - the switching energy. Accuracy of this measurement is within 5 % for high power devices, instead of the more usual 15 % accuracy of presently available test equipment. As well as the AC and DC production tests, the equipment allows characterisation measurements such as short circuit withstand at 2.5 times the rated current, and gate capacitance characteristics.

All optional measurements with their related generators can be added to the base system at any time.

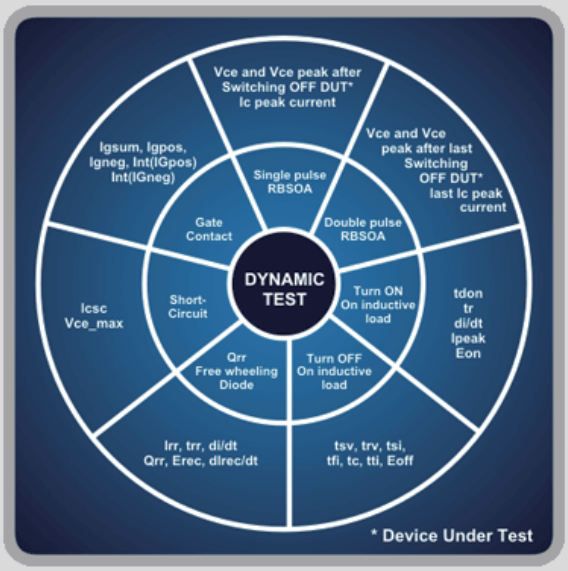


TRd, TRs, TRds test equipment family

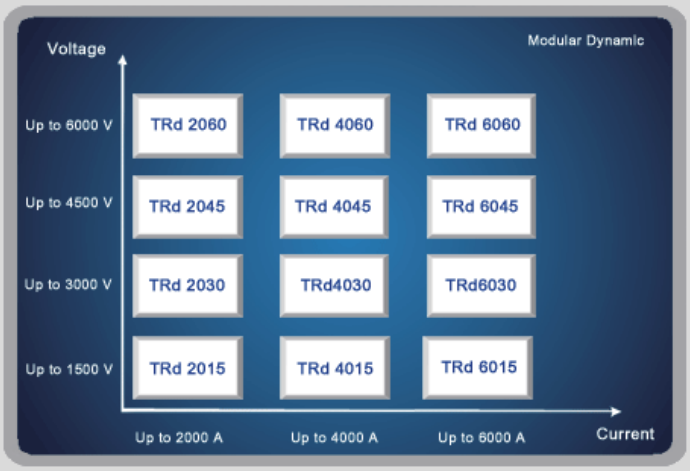
The equipment is designed to test IGBTs, MOSFETs and free wheeling Diodes from single chip to complex power modules and IPMs.
High speed and simplicity of use for the production tests. Characterisation and validation on laboratory mode. Data transfer facility for quality statistical analyses.
One of the key unique features of the equipment is its ability to make static, dynamic, avalanche and short-circuit tests, on the same test head, without removing or reconnecting the device under test.

The open and evolving architecture allows high rate of flexibility and adaptability.
Dynamic only version, static only version and both dynamic and static version are available.
The modular conception combined with the remote diagnostic feature, allow an optimisation of the system down time and an easy maintenance.
Thanks to its unique features, the major power semiconductor manufacturers are equipped with the LEMSYS TRds system family.

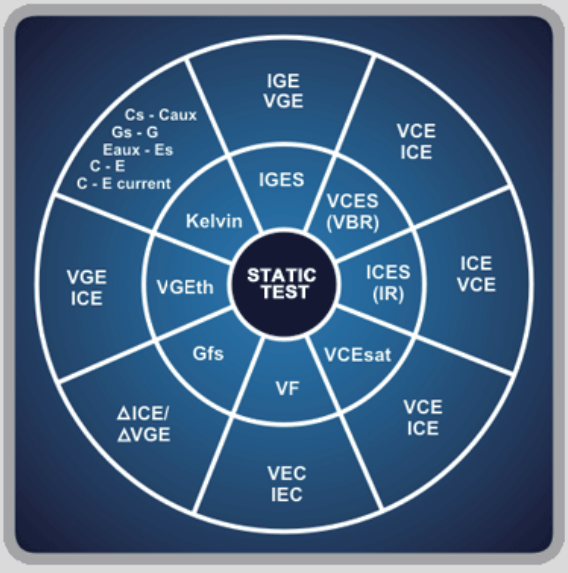
Dynamic test overview



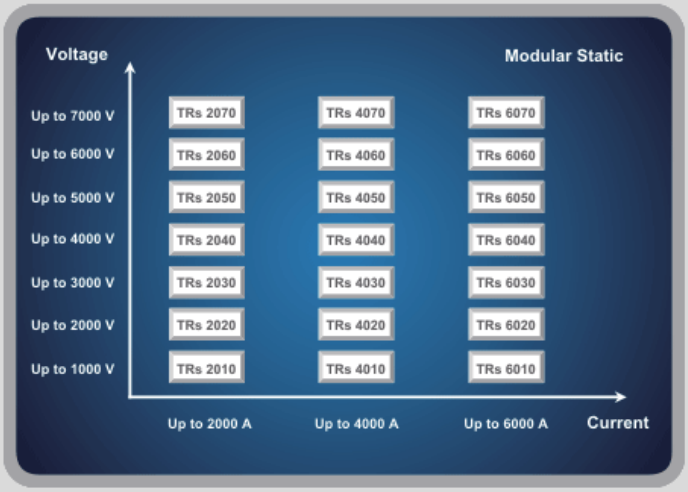
TRd dynamic test equipment family



Static test overview



TRs static test equipment family



Operation and Safety

The graphic user interface application software is running under a real time operating system in the integrated PC. The PC controller is able to work in two different modes: an Engineering mode whereby all parameters can be programmed in software, and an Operator mode where the system runs a pre-programmed test sequence. These test sequences can be edited either locally or remotely via an Ethernet link. Test results are stored in PC memory and can be exportet through a network port to a variety of customer spreadsheet applications.

When handling high voltages and current, operator safety is mandatory. LEM equipment meets all relevant CE regulation. The hazardous area is secured with an Electro-Static-Discharge (ESD) protected sliding door which is locked when the test is running. All controls, including the emergency stop button are within the working zone of the operator. All protection features are controlled by dual redundant circuits for improved reliability.

A set of software tools is available for disgnostics, maintenance and calibration purposes.

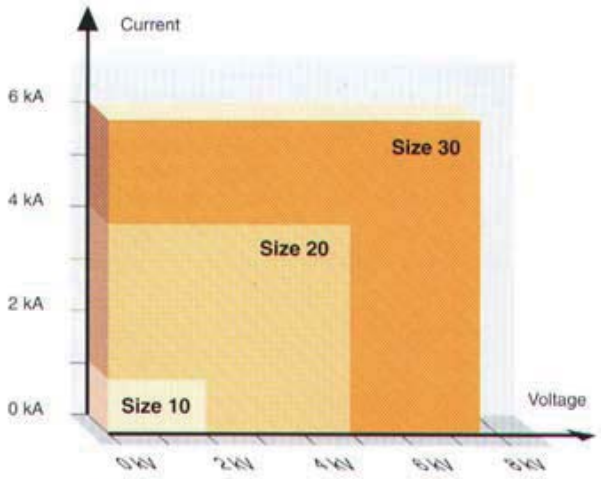
The automated table for every module type

Product Range

With this modular design, any voltage/current configuration is available. The only difference between them is the amount of power involved and consequently, the size of the power head. Three sizes of head are available, providing the best optimisation between price and reliability. (see diagram)

Within the power area defined by each head size, the equipment is fitted with power modules according to the following rules:

For **static tests** the power steps are:
250 A or 2000 A in current
100 V, 1000 V or 5000 V in voltage



For **dynamic tests** the power steps are:
500 A/500 V or 2000 A/1500 V

Customer Options

The open architecture of this design allows great flexibility for any specific requirements such as special generators or measurement modules. Customized power modules and associated software can be integrated easily. For exemple, provisions are already made for handlers' connections and laser marking devices, as well as for testing P-Channel MCTs. For fast and efficient operation in production, the tester can be delivered with an automated table. This heated mobile plate can be programmed to move one or several modules under the power head.

Services & Assistance

We know that for the volume component producer, down time is of the essence. We are therefore able to offer customised service and maintenance contracts for the calibration, planned maintenance and emergency breakdown repair of all LEM equipment.

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