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## **MODULA**

A new approach to EMC testing



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# MODULA

## A new approach to EMC testing



- **Comprehensive concept for immunity testing**
- **Meets new IEC/EN Standards**
- **Innovative operating concept**
- **Open architecture, TCP/IP communication**

### Introduction

Modula is a new product line for the simulation of electromagnetic interference effects. Immunity testing in conformity with international, national and in-house standards is handled with hitherto unimaginable efficiency and with greater operator convenience than ever before. Besides the generation of the classic interference pulses such as Burst and Surge as well as Power Quality simulations, further functions can also be readily incorporated in the system configuration.

Modula represents a new yardstick for pulse generators and systems intended for investigating the immunity of products to electromagnetic interference.

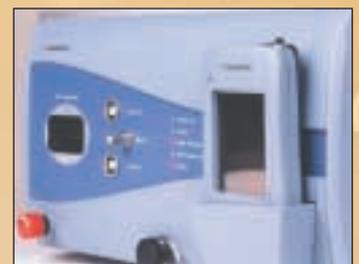
Modula is a system concept that can appear in various guises depending on the intended use and the market needs.

Industry-wide compatibility has been very much borne in mind in the development of Modula. The use of the well-known Interbus as the internal and external interface to every function unit, the Ethernet with the TCP/IP protocol for PC and network links, IEC compatible connectors on the equipment and EUT side, a software concept based on the Lab View standard, running under Windows, provides the greatest possible freedom and flexibility for expansion and for incorporation of available or planned components into the system in the test laboratory.

### The name says it all: Modula is a modular system concept.

All of the system components are defined as function units. Each function unit, e.g. pulse generator, high voltage source, coupling network, etc., reports its presence to the system master controller. By this means the system configuration, corresponding parameters and inter-relationships are precisely defined and are automatically made available to the user. Interbus connections enable any external system components to be included in the same manner as modules that are housed in the system casing itself.

Modula is based on an open architecture concept. Individual function modules can be assembled as necessary to meet market demands. Supplementary functions can be added at any time by the customer himself or the system manager. The command structure and the communication protocol are freely available.



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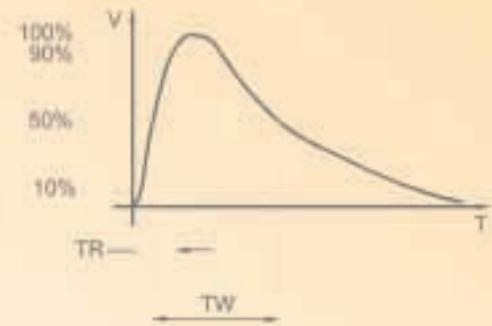
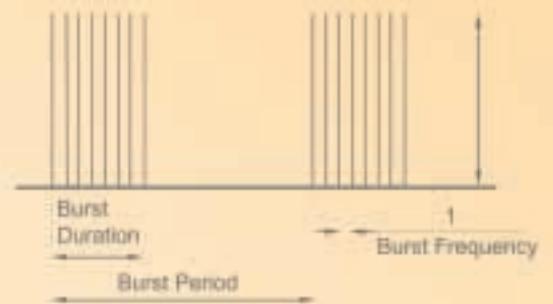
Modula is expandable and future-proof. Upgrades to cope with amendments to the standards are easily achieved with minimum expenditure thanks to the clearly structured modular configuration.

Operational efficiency is a golden rule in the laboratory, the test facility, in manufacturing and quality assurance. Modula features all the prerequisites not only to ensure easy and intuitive operation but also to simplify test tasks through pre-programmed test routines. Test reports are produced on-line in an editable form thereby lightening the administrative workload of the test engineer.

Modularity as a design criterion results in a broad degree of freedom in the configuration of test rigs. Function modules can, basically, be freely assembled in whatever arrangement is most practical yet work together in a unified manner as an integrated system. The market determines the combinations of modules and their manner of "packing". Flexible adaptation also to the ever-changing requirements of the standards is inherent: The concept is hence future-proof.

The use of industrial components and the open system architecture principle enables integration with other laboratory instrumentation and the construction of tailored, automated test installations.

The appearance reflects the functionality of the system and lends new aspects to laboratory and manufacturing environments.



## Concept

Modula is considerably more than a new category of instrument: a whole ambitious concept lies behind its friendly face.

Central to the overall concept is, of course, the correct generation of pulses and interference signals with flexible matching of the parameters and generous test margins.

While innovative methods of operation and record keeping increase the convenience and user-friendliness on the one hand, they are on the other hand trimmed to raise the efficiency of the work in the test laboratory.



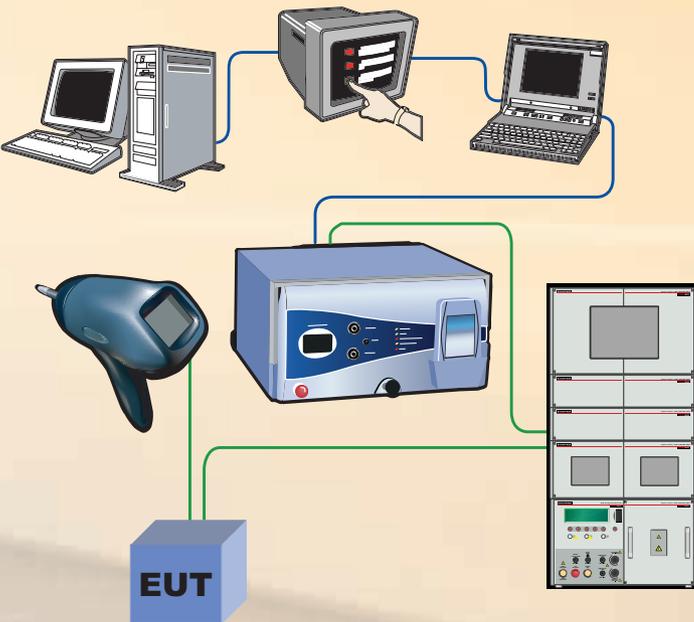
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## Modularity

### For Modula read modularity:

All the system components are defined as function modules. These can be generators, coupling networks, high voltage units, switches, accessories, etc. Each function module incorporates a certain amount of local "intelligence".

This principle ensures that the way in which a system is assembled remains flexible and free. Function modules are no longer restricted to a prescribed mechanical arrangement. The distribution of the functions is now determined by the application.



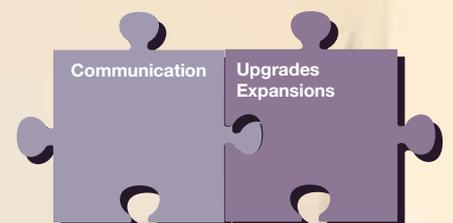
A field-bus links all the function modules to a master controller, which has full control over all the associated units. It knows the detailed properties of each module and is hence able to determine the overall test system configuration with the relevant parameter limits.

The user is presented with all the test functions possible with a particular hardware configuration. Pre-programmed test routines from the library and stored user's-own tests are checked for plausibility with the available hardware.

Modularity of this sort also means economical up-dating in the event of changes to the standards or newer requirements coming along. Should a generator have to be replaced, for example, the instrument casing, coupling network, high voltage unit, power pack, etc. can be used further.

Furthermore, if necessary, a test assembly can be built up in stages as the budget allows; subsequent up-grading is always possible.

Modularity is also a big plus in the event of a replacement part becoming necessary especially when, as is the case with Modula, fault detection is supported by the system software.



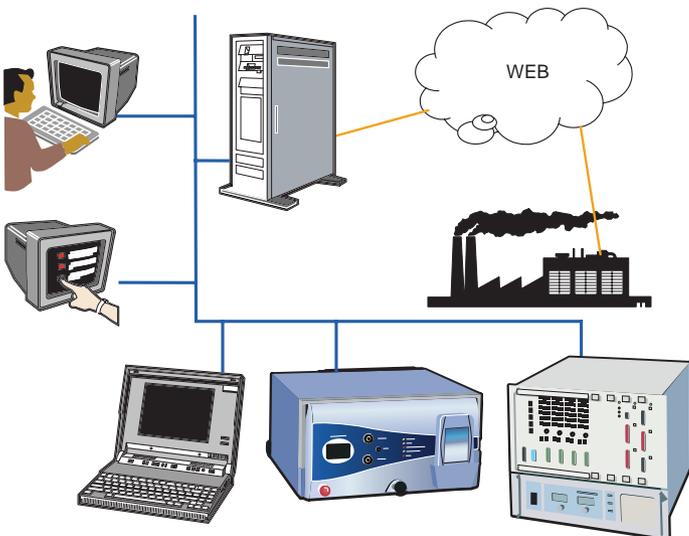
### Industrial standards everywhere

Wherever possible, industrial standards as well as products and technologies currently commercially available on the market have been utilized in order that the Modula concept blends seamlessly with today's work areas, complex system structures and communications networks.

The function modules communicate via an Interbus connection. The Interbus is a widely used field bus with solid and interference-free components intended for use in an industrial environment. There is a large number of Interbus modules available on the market. This provides the basis whereby the user can configure his test installation individually to monitor items under test, perform automatic operations or to harmonize with other processes.



An Ethernet link provides the communications path to the world of the PC. Both an electrical and an optical interface are built into Modula. The communications protocol used is also a standard: TCP/IP. Any of today's notebooks and PCs can hence be readily connected without the need for further accessories. All the pre-requisites for networking are also incorporated.



WIN Modula, the test management and control software is based on Lab View, yet another international standard, which enables the customer to connect still further functions.

An innovative approach has been taken in the matter of the operator's interface, too. A perfectly normal PDA is used as the control unit, embedded in a special housing equipped with an optical booster. This optical link to the Modula system provides

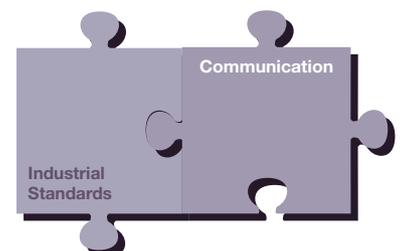


the greatest possible freedom of movement and convenience while ensuring immunity against interference commonly found in an EMC test laboratory.

All connectors used are of industrial quality - type approved for the voltages and currents involved - and meeting the safety requirements called for in laboratories and manufacturing areas.

### Open architecture

The Interbus compatibility and the connectivity afforded by TCP/IP result in an open architecture providing the ideal basis for the customer to use the platform for system expansions or to integrate the whole instrumentation family into an existing automation concept. The command structure is made available for users who wish to set up interactive procedures while the widespread familiarity of Lab View and the availability of drivers for every type of device also play a large part in simplifying integration.



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## Safety

Traditionally, Schaffner test equipment ensures the greatest active and passive safety for the user. Achieving this entails correctly specified industrial connectors, an interlock system to link in with safety circuits, constant status monitoring and display, the provision for remote operation and last but not least an emergency stop button. All the instrumentation is tested to ensure compliance with the safety requirements of EN 61010.



## Networking capability

Modula is capable of being networked thanks to the use of Ethernet as the communications interface. In the larger laboratories this provides the necessary basis for networking in conjunction with other lab instrumentation and with the existing computer infrastructure. The distributed execution of test procedures and the evaluation of results are simplified while remote diagnostic facilities and updates with new standard tests are readily possible and even a link to the Internet is viable, for example, for servicing and maintenance purposes.

The test management concept of the WIN Modula software supports the networking capability to a considerable extent.

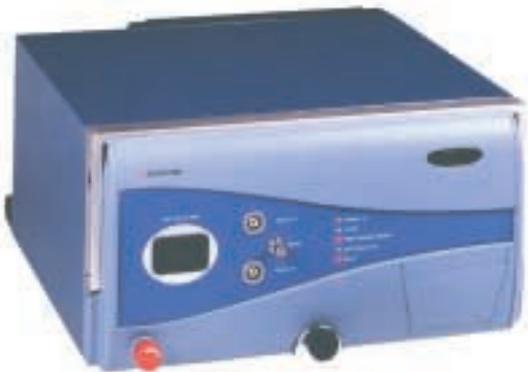


### Operating concept

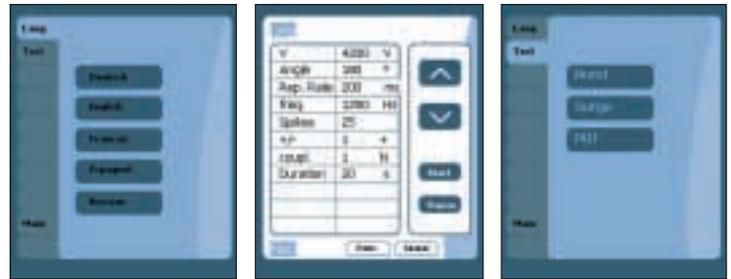
A new approach to the man-machine interface has been taken. The use of a perfectly conventional PDA in combination with a robust casing and an IRDA booster results in significant advantages for the user.

Space around an EMC test rig can be rather tight and the requirement to use short cables and defined earthing points means that quite often the generator cannot be placed in a very user-friendly position. Some standards even call for the test generator to be placed on a reference earth plane on the floor in certain cases.

A cable-free optical control link is the answer. With a transmission range of over 10 m (33 feet) and a field of view of 140° the Modula components can be readily operated from the comfort of the laboratory office desk



A tray in the Modula 6000 base unit provides a means to charge the hand-held remote controller and it can, of course, also be used to operate the system from this position.

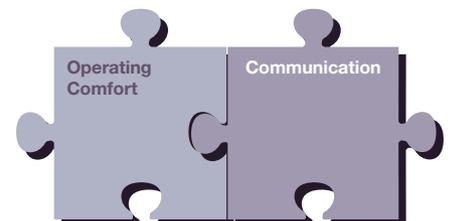


The reasonably large, colour touch screen of the PDA enables the necessary quantity of information to be displayed in a clear manner. Command inputs are made using the PDA's conventional means: keypad, prod or index finger. Furthermore, the program includes slider regulators in order to be able to

adjust parameters such as voltage or phase angle dynamically during a test.

Important standard tests can be called up from a library and user-specific tests can be stored for later use.

The user interface presented on the mobile hand-held controller has been reproduced in the form of simplified notebook software. This runs under Windows 95/98/ME/2000 and XP. Since all new notebooks and PCs are automatically equipped with an Ethernet interface, Modula can be connected using a standard cable. Optionally an optical cable can be used. There are no connection problems as the corresponding interface is already integrated into the Modula master controller. The basic software is a component part of each delivery.



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## Software

Where greater demands for automation, convenience, file handling and report generation exist there is the WIN Modula software package. This is both test executive and management software in one.

A new approach has been taken to the programming of the test parameters. Taking the form of a data base, each complete pulse definition is recorded as a profile and subsequently executed on command, assembled into simple or complex sequences and expanded with further process control commands.

This provides a factual and clear presentation of the test conditions and progress during the test set up phase and while the test is running.

The library of tests supplied can be continually updated to keep in step with the relevant standards. Schaffner provides further test sequences and pulse definitions via the Internet in keeping with market trends.

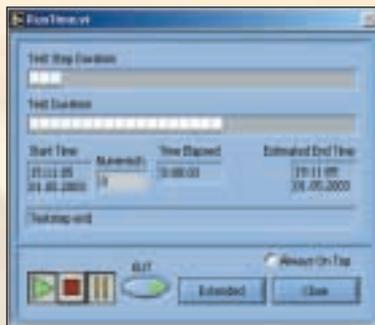
An off line mode of working enables test sequences to be created without having to have a system connected. Plausibility and limit checks support the user while setting up the logical definition of the pulse parameters and coupling methods.

The associated help library reacts in a context-sensitive manner and therefore goes directly and exactly to the appropriate information.

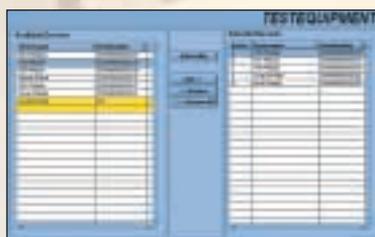
An integral user-access manager permits access restrictions to be imposed if necessary on the execution of test routines and program changes.

WIN Modula is multilingual. The program can be set to run in arbitrary national languages to suit the prevailing market conditions.

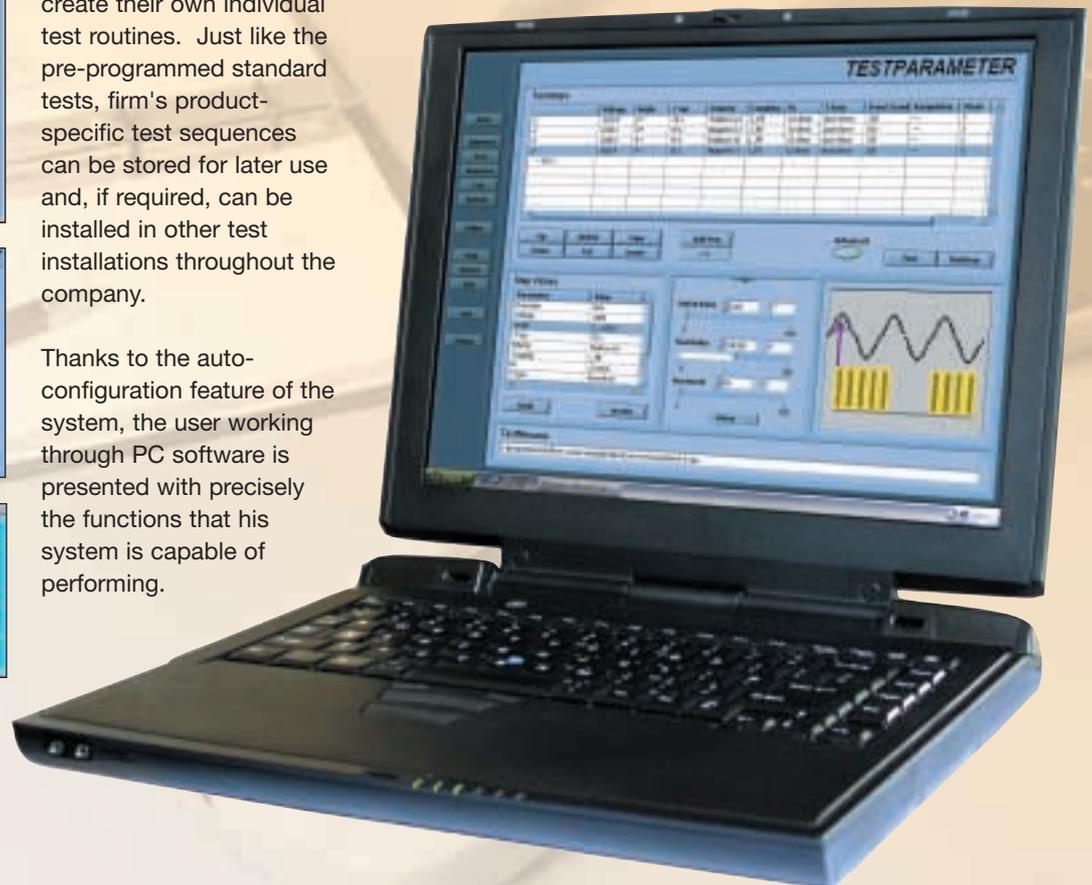
WIN Modula is compatible with Windows 95/98/ME/2000 and XP. Communication takes place via a standard cable connected to the Ethernet LAN interface. Optionally, an optical Ethernet link can be established instead since the appropriate interface is already built into the Modula master controller.



Standard tests from the library usually also form the basis for users to create their own individual test routines. Just like the pre-programmed standard tests, firm's product-specific test sequences can be stored for later use and, if required, can be installed in other test installations throughout the company.



Thanks to the auto-configuration feature of the system, the user working through PC software is presented with precisely the functions that his system is capable of performing.





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## Standard configurations

Thanks to Modula's modular concept any arbitrary arrangement and combination of function modules is basically possible. The market, however, favors the need for certain standard configurations that are always in demand for typical applications.



## IEC Class

The Modula 6000 Series offers a family of compact and handy instruments for the IEC/EN class of standard tests. The test requirements involved in product standards for consumer goods and industrial electronics are readily covered thanks to Modula's generous test margins. Expandable single function devices with integral coupling networks for surge and burst as well as power quality generators are available in various combinations. The Modula 6000 multifunction generator covers most of the EN product standards. An external ESD generator (NSG 435 or NSG 438) is used when ESD tests are called for. These devices can be integrated softwarewise into the Modula concept as necessary.



Technical Data		MODULA 6000 Mainframe
<b>Mainframe</b>		Table top unit with rack mounting option - Handles in front and back 238mm x 440mm (19") x 491mm
	<b>Dimensions H x W x D</b>	
	<b>Weight:</b>	25kg
<b>Instrument Power</b>		85 - 265Vac, 47 to 63Hz; IEC-connector, Power Switch, Fuses
<b>Operating elements/ Connectors</b>	<b>Back panel:</b>	EUT supply: Harting connector with pins for power line and aux. supply Additional ground connector
	<b>Front panel:</b>	Emergency shut off, EUT connector IEC 320 / HV coaxial connectors Surge High & Low HV coaxial connector Burst - out / HF- ground connection Drawer for mobile handheld controller with charging connector Status LED's for power, pulse, high voltage, EUT supply, output coupling, error
<b>Environmental conditions</b>		+5° - 40°C, 20 - 80% rel.humidity (non condensing), 68 -106 kPa pressure Temp. controlled ventilators
<b>Safety standards</b>		IEC 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use
<b>EMC standards</b>		EN 61000-6-2 Electromagnetic compatibility: Generic standards -Immunity for industrial environments
<b>Master Controller</b>		System controller for configuration, real-time tasks, pulse library, test memory, user interface and communication Connector for system enhancement (Interbus), Osc. trigger, EUT fail signal, end of test signal and remote pulse trigger Comm. interface (Ethernet TCP/IP) RJ 45 and optical
<b>Coupling network</b>		Burst/Surge coupling network according to IEC 61000-4-x. Up to 260 Vac or dc, 16A continuous, 25A short term

Mobile Handheld Controller		MHC 6501
		Mobile handheld controller in plastic shell using a standard PDA (Toshiba e3xx, Windows CE), with control software and graphical user interface
<b>Data transmission</b>		Boosted optical infrared transmission, operating distance up to 10m, operating angle up to 140°
<b>Keyboard/Display</b>		Graphical color display and touch panel
<b>Operating software</b>		Multilingual Controls all present parameters (according to configuration) Dynamic parameter setting during execution of test Load and store of (standard)tests Graphical display of run time status
<b>Miscellaneous</b>		The standard application of the PDA may still be used

Burst Generator		EFT 6501
		Generator according to IEC 61000-4-4 / plug-in module
<b>Pulse amplitude</b>		± 200V to 4.4kV in 10V steps; open circuit ± 100V to 2.2kV in 10V steps; 50Ω matching system
<b>Pulse data</b>		Rise time: 5ns (10-90%) Pulse width: 50Ω load: 50ns ± 30% 1kΩ load: 50ns -15/+100ns
<b>Burst frequency</b>		100Hz to 1MHz / single pulses
<b>Pulses per packet</b>		1 to 600 pulses
<b>Burst period</b>		100ms to 100s / in 10ms steps
<b>Coupling</b>		P; N; SE; P&N; P&SE; N&SE; P&N&SE to reference ground; 50Ω pulse output
<b>Modes of operation</b>		Single pulses packages, test duration, continuous
<b>Phase synchronization</b>		Asynchronous, synchronous 0 to 359° / in 1° steps

Surge Generator		SRG 6501
		Generator according to IEC 61000-4-5 / plug-in module
<b>Pulse voltage (open circuit)</b>		± 200V to 4,4kV; 1.2/50µs / in 10V steps
<b>Pulse current (short circuit)</b>		± 100A to 2.2kA; 8/20µs
<b>Impedance</b>		2 / 12Ω
<b>Pulse repetition</b>		5 to 600s / in 1s steps
<b>Coupling</b>		P→N; P→SE; N→SE; P&N→SE; coaxial pulse outputs
<b>Modes of operation</b>		Single pulses, test duration, continuous
<b>Phase synchronization</b>		Asynchronous, synchronous 0 to 359° / in 1° steps

Power Fail Generator		PQT 6501
		Generator according to IEC 61000-4-11 & -29 / plug-in module
<b>EUT current</b>		Up to 16A eff continuous, 25A short term
<b>EUT Voltage</b>		Up to 260 Vac/dc
<b>Output voltage change under load</b>		0 - 16A: < 5% (for 230V supply)
<b>Peak inrush current capability</b>		500A (at 230V)
<b>Phase angle synchronization</b>		0 -359° in 1° steps
<b>Switching times</b>		1 to 5µs (100Ω load)
<b>Event timing</b>		20µs to 1min
<b>Event repetition timing</b>		40µs to 10min

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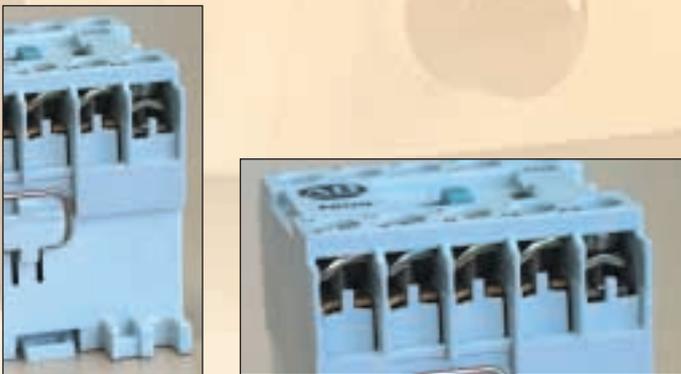
## Accessories

The compatible accessories extend the field of application and the convenience level at the test rig.

When appropriate, the accessories are operated as external function modules via the Interbus and can hence be fully integrated into the Modula program environment.

### Circuit breaker CBR 6501

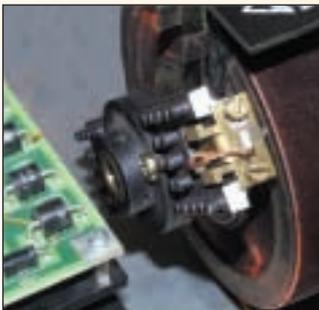
External protection and supervisory device for the EUT power path. Once connected, the CBR 6501 enables the power to the EUT to be switched on and off under program control. Further, a current limit can also be defined such that, if exceeded, an EUT fault is registered or the test can be aborted.



### Variable transformer VAR 6501

Motorized Variac for the programmed setting of over and under voltages, voltage ramps and voltage variations.

The VAR 6501 is an externally placed function module belonging to the Modula system.



The basic standard IEC 61000-4-11 and several related product standards call for a controlled voltage variation with defined ramps. The VAR 6501 fulfils these requirements and enables other voltage swings to be achieved as specified by equipment manufacturers.

## Magnetic field tests

Pulsed magnetic fields are produced through the use of antennae INA 721 or INA 722 in conjunction with the surge generator. A special test menu takes the antenna factor into account and handles the field strength settings correctly in A/m.



An amplifier is necessary for the simulation of mains frequency magnetic fields. The MFO 6501 option is operated as an external function module via the Interbus and is hence fully integrated into the Modula program environment. Different field strengths are achieved depending on the choice of either the INA 721 or INA 722 antenna.

### Technical Specifications

### INA 721 / INA 722

Magnetic field coil	1m x 1m standard coil according to IEC 61000-8 &-9 with stand
Power line magnetic field	Field strength 0,1 to 4A/m (model INA 721) Field strength 0,1 to 40A/m (model INA 722)
Pulsed magnetic field	Field strength 100 to 2000A/m Frequency 40 to 70Hz

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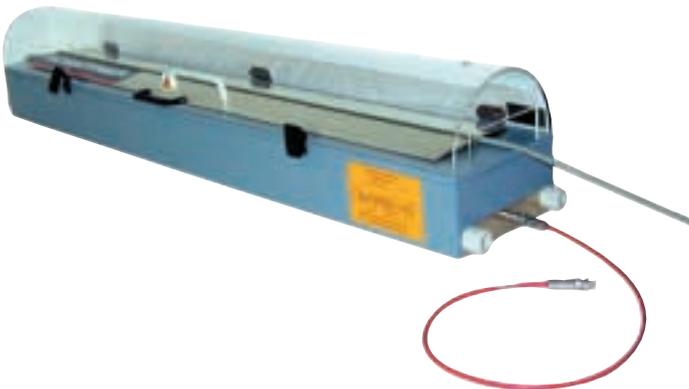
## ESD Interface

The option of using the ESD-interface EIF 6501 enables the ESD generators type NSG 435 and NSG 438 to be integrated into the Modula program environment. Although ESD tests mostly necessitate manual operation, integration with other instrumentation can be of use in the interests of producing a comprehensive, composite test report. An interference resistant interconnection is made by the use of an optical cable.



## Capacitive Coupling Clamp

The capacitive coupling clamp type CDN 8015 is used to inject burst pulses into data and signal lines (or into mains cables in the case that no suitable coupling network is available for higher currents). The CDN 8015 can be linked into the interlock safety circuit to ensure the inherent safety of the operator as is fundamental in the overall system concept.



Technical Specifications		CDN 8015
Capacitive coupling clamp	Clamp according to IEC 61000-4-4, active coupling length 1m	
Typical coupling capacitance	50 to 200pF	
Cable diameter	Up to 40mm	

## Data line coupling networks

The IEC/EN 61000-4-5 standard calls for certain test requirements on data, signal and telecommunications lines for particular products.

Appropriate coupling units are available as the products CDN 117 and CDN 118.



Technical Specifications		CDN 117
Data line coupling network	Network according to IEC 61000-4-5 including coupling adapters for spark gaps and capacitors	
Data line path	50Vac; 60Vdc; 1.5A; one line pair	
Pulse path	1.2/50µs pulse, up to 6.6kV, 40Ω series impedance; differential and line to ground coupling mode	



Technical Specifications		CDN 118
Comm. line coupling network	Network according to IEC 61000-4-5 including coupling adapters for spark gaps and capacitors and resistor networks 100Ω and 160Ω	
Comm. line path	50Vac; 60Vdc; 0.5A; four lines	
Pulse path	1.2/50µs and 10/700µs pulse, up to 6.6kV line to ground coupling, 3KV line to line coupling	

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## Ordering Information

### Standard configurations

MODULA 6000 Multi-function generator for immunity testing in accordance with the EN/IEC 61000-4-x series. With Burst Generator EFT 6501, Surge Generator SRG 6501, Mains Drop-out Simulator PQT 6501, single-phase coupling network CDN 6501 (260V/16Aeff), basic control software for PC's running under WINDOWS 98/ME/2000/XP and LAN (TCP/IP) interface.

MODULA 6210 Burst Generator (EFT 6501) with single-phase coupling network CDN 6501 (260V/16Aeff), basic control software for PC's running under WINDOWS 98/ME/2000/XP and LAN (TCP/IP) interface. Can be expanded at any time with, e.g. SRG 6501 and PQT 6501.

MODULA 6230 Surge Generator (SRG 6501) with single-phase coupling network CDN 6501 (260V/16Aeff), basic control software for PC's running under WINDOWS 98/ME/2000/XP and LAN (TCP/IP) interface. Can be expanded at any time with, e.g. EFT 6501 and PQT 6501.

MODULA 6220 Mains Drop-out Simulator (PQT 6501) with basic control software for PC's running under WINDOWS 98/ME/2000/XP and LAN (TCP/IP) interface. Single-phase coupling network CDN 6501 (260V/16Aeff) incorporated for easy expansion with, e.g. EFT 6501 and SRG 6501.

### Options

MHC 6501 Mobile hand-held controller (PDA) with colour display and touch-screen operation.

WIN MODULA Test and test management software with test program library, automatic test report production, test sequencer, access manager, etc.

EFT 6501 Burst generator module for subsequent expansion.

PQT 6501 Mains drop-out simulator module for subsequent expansion.

SRG 6501 Surge generator module for subsequent expansion.

CBR 6501 Circuit breaker for the EUT supply with adjustable current monitor.

VAR 6501 Program-controlled motorised variac (250V/5A) for the simulation of under and over-voltages and voltage variations.

INA 721/722 Magnetic field antennae for pulsed magnetic fields and as an accessory to the MFO 6501

MFO 6501 Interface and amplifier unit for mains frequency magnetic field tests with magnetic field antenna type INA 721 or INA 722

CDN 8015 - M Capacitive coupling clamp for data line testing with burst generators in compliance with EN/IEC 61000-4-4

CDN 117 - M Data line coupling network for surge pulses in accordance with EN/IEC 61000-4-5

CDN 118 - M Telecom coupling network for surge pulses in accordance with EN/IEC 61000-4-5

CAS 3025 Verification set for burst pulse measurements

MD 200 Differential high voltage probe for pulse verification measurements on surge generators

Ask your nearest Schaffner sales organisation for further configurations, options and availability.



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Surge Hi

Power

Pulse

High Vo

EUT Po

Burst

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