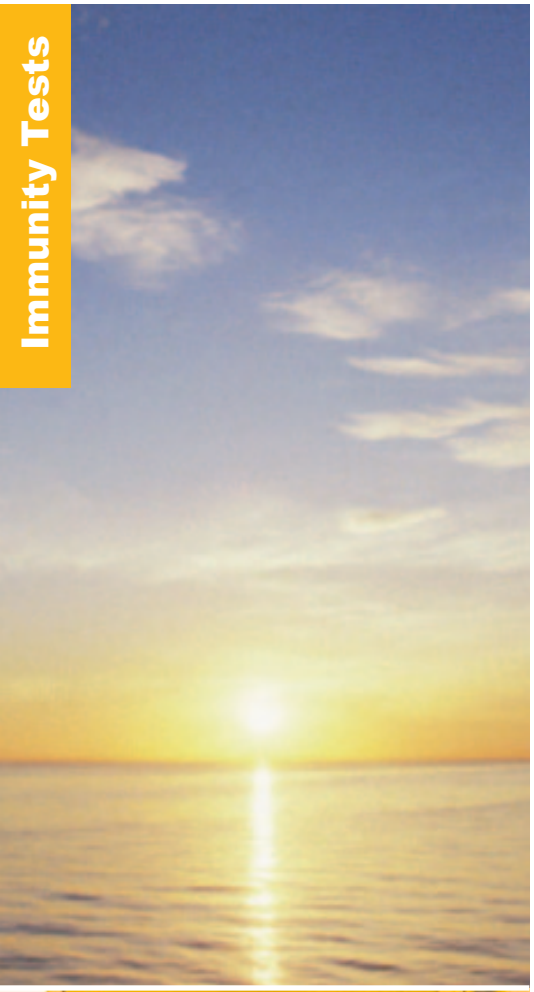
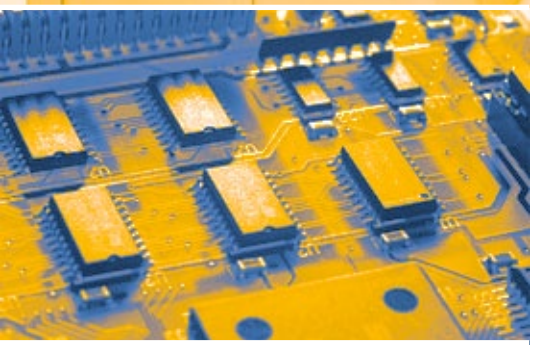
Immunity Tests





EMC - PARTNER

Transient Test System

Brief Overview of Phenomena

Transient Test System generates EMC events that can be observed in the low power distribution system, telecommunication or data lines.

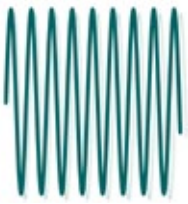
Transient Test System replicates the following phenomena:

- **Electrostatic Discharges (ESD)**
  A person becomes electrostatically charged by walking over an insulating floor surface. The capacity of the body can be charged to several kilovolts and is discharged when contact is made with an electronic unit or system. The discharge is visible as a spark in many cases and can be felt by the person concerned, who receives a „shock“. The discharges are harmless to humans, but not to sensitive, electronic equipment. The resulting currents cause interference or make entire systems „crash“.

- **Electric Fast Transients (EFT) / Burst**
  Industrial measurement and control equipment nearly always use conventional control units containing relays or other electro-mechanical switching devices. Fluorescent lamp ballast units, insufficiently suppressed motors (hair dryers, vacuum cleaners, drills, etc.) are found everywhere in the public power supply. All of these are primarily inductive loads which generate interference when switched on or off. EFT events, can cause microprocessor units to malfunction or reset, with corresponding disruption to normal operation.

- **Combination Wave Generator (CWG), Ring Wave and 10/700µs**
  Surge events can be generated by lightning phenomena, switching transients or the activation of protection devices in the power distribution system. A surge itself is influenced by the propagation path taken so that impulses from the same event may have different forms depending upon where a measurement is taken. Combination Wave Generators (CWG) simulate a surge event in power lines close to or within buildings. Ring waves are bipolar oscillatory events, only measured on power lines within a well protected environment. Because of the special impedance characteristics within telephone systems, surges tend to be longer and are represented by the 10/700µs waveform.

  Mostly the disturbances are tolerable because they are single events.



- **Power Frequency and Pulse Magnetic Fields**
  Under normal operating conditions, an AC current generates a steady magnetic field so that equipment, such as monitors, close to AC power lines could suffer interference. Under fault conditions, a sudden high current level can result in a short duration magnetic field.

  Lightning strokes or short circuit fault currents in the power network can generate high level short duration magnetic fields.

- **AC & DC Dips/Interrupts**
  Voltage failures occur following switching operations, short-circuits, response of fuses and when running up heavy loads.

  The quality of the electrical power supply is increasingly becoming a central topic of discussion. The interference sources in the mains, caused by electronic power control with non-linear components e.g. thyristors are used more frequently in domestic appliances such as hotplates, heating units, washing machines, television sets, economy lamps, PCs and industrial systems with speed-controlled drives.

Applicable Standards

International Electrotechnical Committee (IEC)

IEC 61000-4-2 (Ed1.2:2001): Testing and measurement techniques - Electrostatic discharge immunity test.

IEC 61000-4-4 (Ed2:2004): Testing and measurement techniques - Electrical fast transient / burst immunity test.

IEC 61000-4-5 (Ed2:2005): Testing and measurement techniques - Surge immunity test.

IEC 61000-4-8 (Ed1.1:2001): Testing and measurement techniques - Power frequency magnetic field immunity test.

IEC 61000-4-9 (Ed1.1:2001): Testing and measurement techniques - Pulse magnetic field immunity test.

IEC 61000-4-11 (Ed2:2004): Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

IEC 61000-4-12 (Ed2:2006): Testing and measurement techniques - Oscillatory waves immunity test (Ring wave).

IEC 61000-4-16p (Ed1.1:2002): Testing and measurement techniques - Test for immunity to conducted, common mode disturbances in the frequency range 0Hz to 150kHz.

IEC 61000-4-29 (Ed1:2000): Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests.

European Standard (EN)

The same standards are applicable as for IEC (see above).

International Telecommunications Union (ITU)

K.20 (February 2000): Resistibility of Telecommunications Equipment installed in a telecommunications centre to overvoltages and overcurrents

American National Standards Institute (ANSI)

C62.41 (Date): American National Standard for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment.

Test System Overview

Test System Feature

Transient Test System has many unique and outstanding features:

- Up to 6kV surge levels
- CWG, 10/700µs **and** ring wave together in one instrument
- Internal motor variac
- All parameters on one screen
- Parameter change during operation (+/-)
- Internal program memory
- Backlit LCD display
- Electronic polarity change
- Semiconductor switches
- Compact design
- Fulfills ALL standard requirements
- Magnetic field test menu
- Expansion to 3-phase capability
- Remote control and software upgrade through standard interface
- Wide range of accessories
- 2 year warranty

User Benefits

The technical excellence and many unique features translate directly into benefits for the user:

- Cost effective solution to meet many test requirements
- Increase quality of test object
- Real time parameter change, ideal development tool
- Save operator time with the automated test routines and test report facility
- Easy integration into a full test suite
- Unparalleled reliability and system up-time

Generators

Transient Test System comprises the generator model TRA2006.

Available with single or multiple events (ESD, EFT, surge, ring, dips), they can be up-graded to add further capability when required. Unique in it's class, TRA2006 includes, as standard, an internal motor variac to enable dips and variation tests, at any user programmable level, as per IEC 61000-4-11.

The most significant test parameters can be programmed and then adjusted in real time to assist in finding the exact immunity level of an EUT. The +/- keys are used to adjust; test voltage level, EFT spike frequency, EFT burst duration, synchronisation angle, polarity and EUT supply voltage (via internal variac). The coupling paths; Line, Neutral and Protective Earth can either be automatically programmed or manually selected using switches on the front panel.

Standard accessories include 10A and 16A mains cables, GENECS remote control software on a CD, serial link cable to use with the GENECS software, user manual with verification protocol and conformity declaration.

- **TRA2006**

  Capable of being equipped with ESD up to 15kV air discharge (requires ESD2000), EFT, CWG up to 6kV (1.2/50µs open circuit and 8/20µs short circuit), plus the ability to perform 100kHz Ringwave and 10/700µs surges up to 6kV.

  AC dips/interrupts & variations plus DC interrupts. TRA2006 features a single phase 16A AC/DC CDN enabling all power borne immunity tests to be performed on a single EUT without unplugging or reconfiguring the test set-up.

  TRA2006 limited feature versions can be upgraded to full configuration when the need for additional tests arises.

  In it's full version, TRA2006 is the most complete compact generator available. Offering in a single unit phenomenal power and unparalleled capability. plus the ability to perform CWG 1.2/50µs open circuit and 8/20µs short circuit and 10/700µs surges up to 6kV.

Long duration testing is made easier by use of the EMC PARTNER software packages. Using either GENECS or TEMA software, the units can be programmed, automatically started and test reports generated.

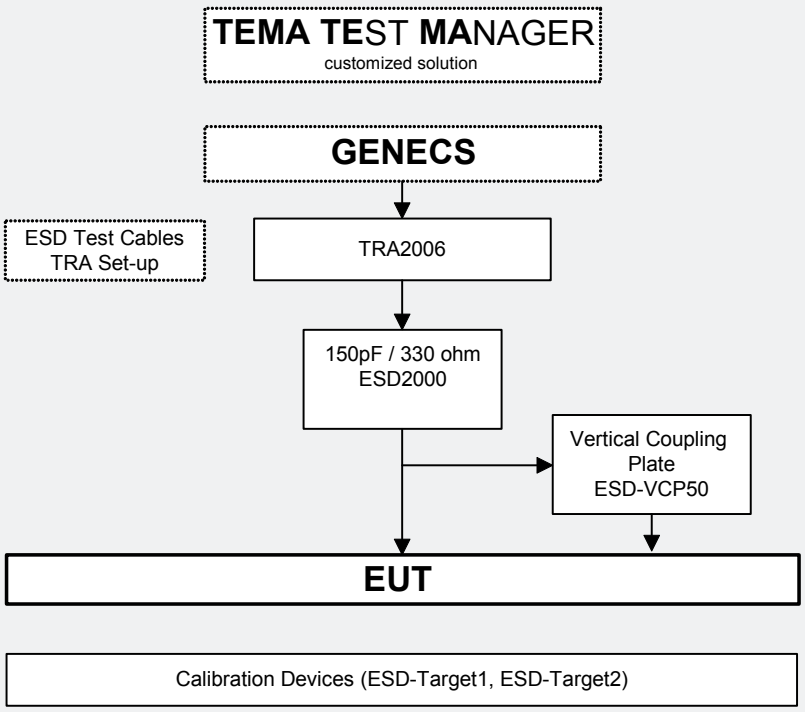
The compact design enables many different test standards to be performed using only a single unit. A broad range of accessories enable testing to many additional applications.

Special configurations are available to meet unique customer requirements, long duration voltage interrupts as required for Electricity meter testing (IEC62052-11 Annex B) are one example of the many unique capabilities available from EMC PARTNER.

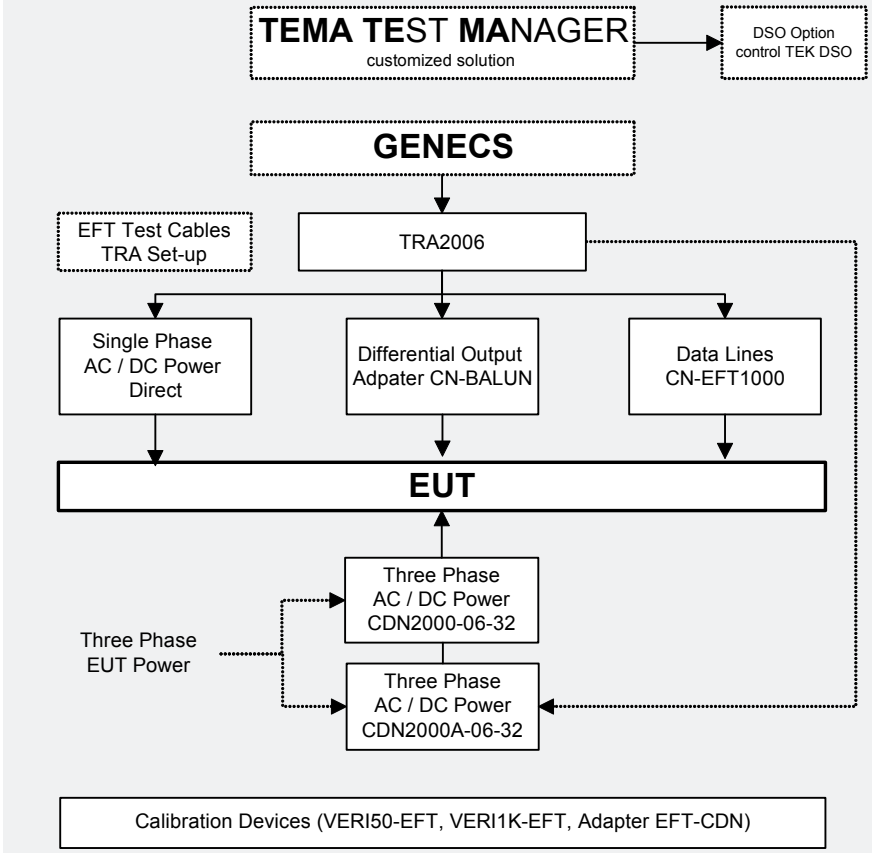
TRA2006

Flowcharts

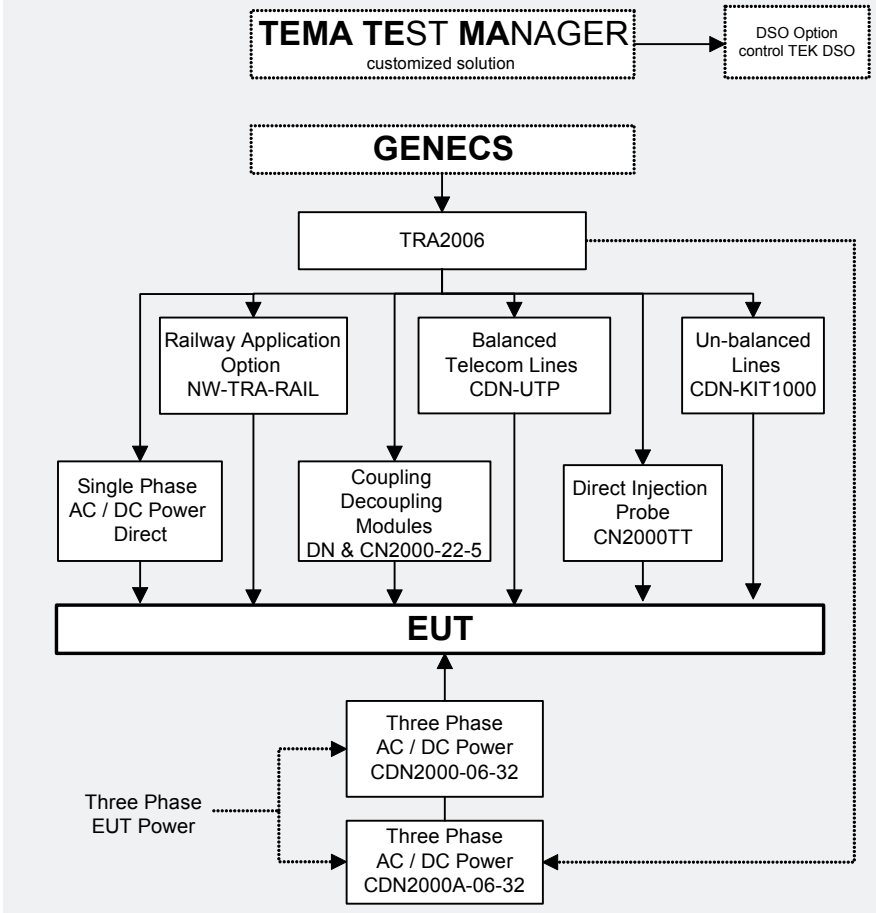
ESD



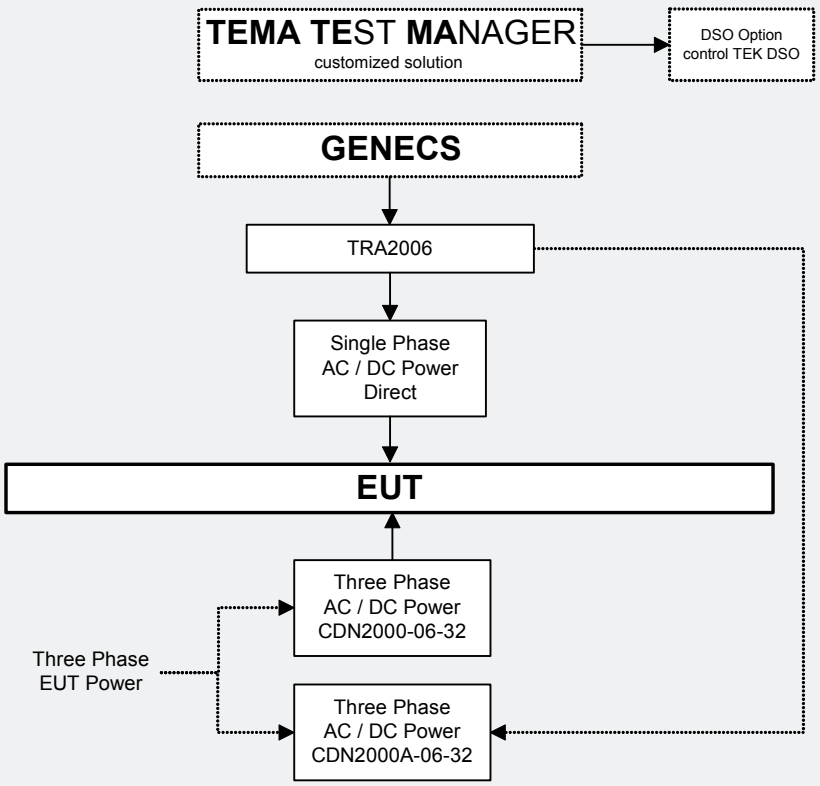
EFT


TEMA TEST MANAGER
customized solution
DSO Option
control TEK DSO
GENECS
EFT Test Cables
TRA Set-up
TRA2006
Single Phase
AC / DC Power
Direct
Differential Output
Adpater CN-BALUN
Data Lines
CN-EFT1000
EUT
Three Phase
AC / DC Power
CDN2000-06-32
Three Phase
EUT Power
Three Phase
AC / DC Power
CDN2000A-06-32
Calibration Devices (VERI50-EFT, VERI1K-EFT, Adapter EFT-CDN)

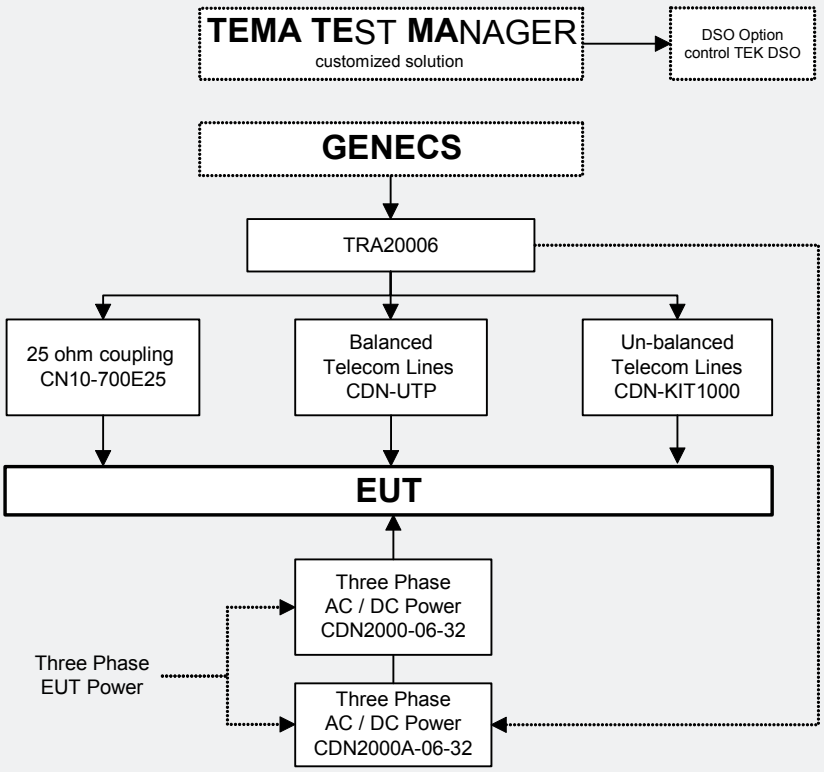
CWG


TEMA TEST MANAGER
customized solution
DSO Option
control TEK DSO
GENECS
TRA2006
Railway Application
Option
NW-TRA-RAIL
Balanced
Telecom Lines
CDN-UTP
Un-balanced
Lines
CDN-KIT1000
Single Phase
AC / DC Power
Direct
Coupling
Decoupling
Modules
DN & CN2000-22-5
Direct Injection
Probe
CN2000TT
EUT
Three Phase
AC / DC Power
CDN2000-06-32
Three Phase
EUT Power
Three Phase
AC / DC Power
CDN2000A-06-32

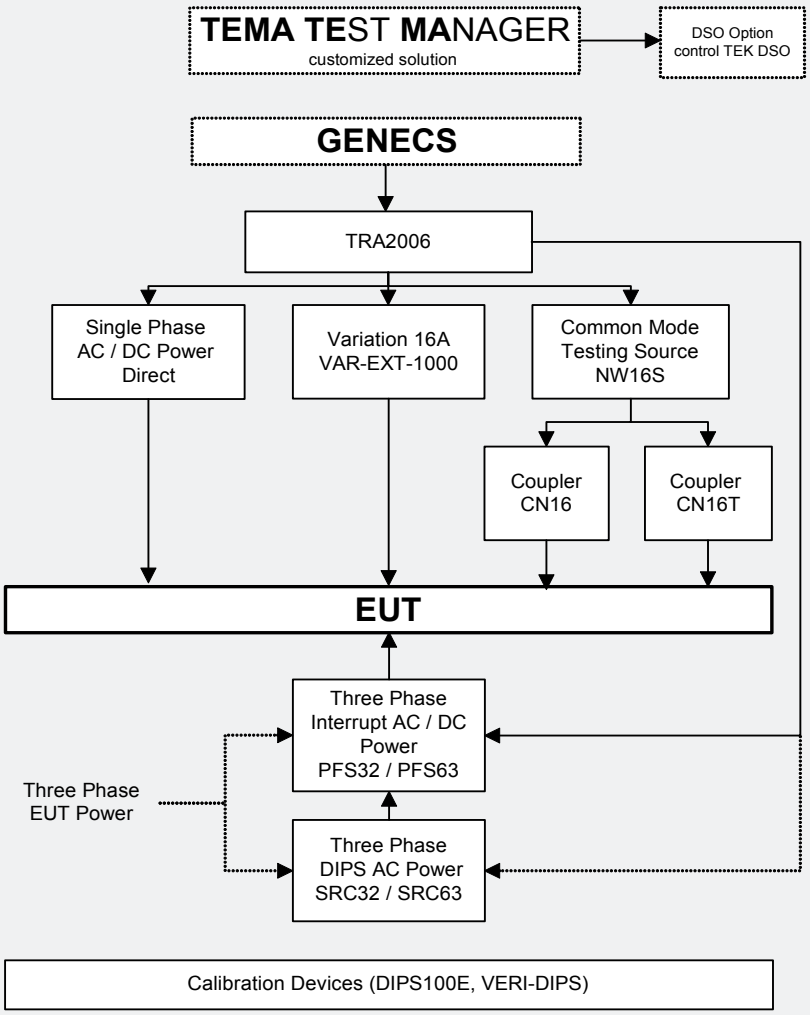
Ring Wave 100kHz



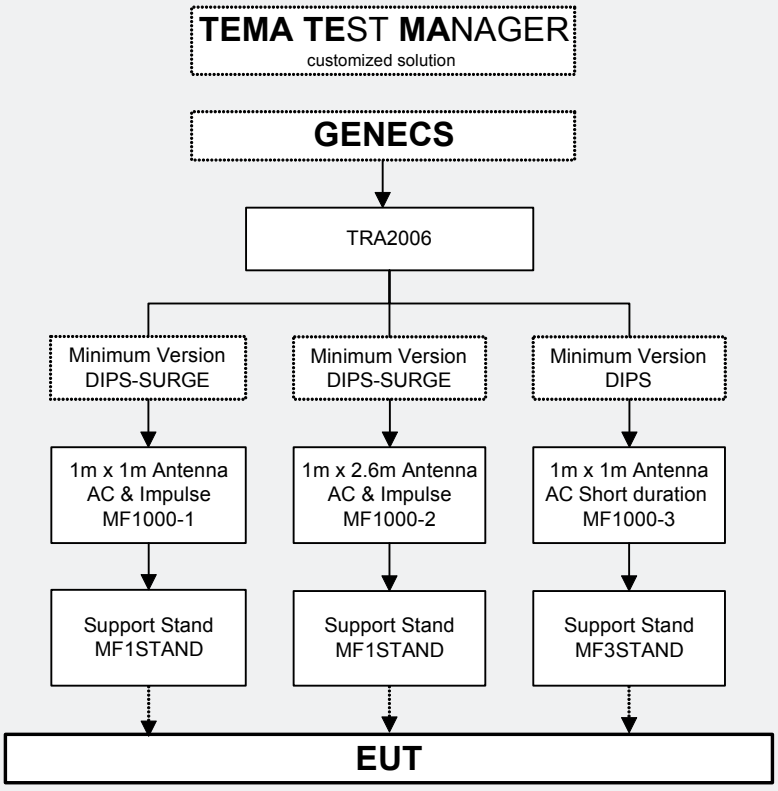
10/700µs



Dips/Variations and Common Mode Tests



Magnetic Fields



Generator Specifications

ESD

Air discharge	2 up to 16kV
Contact discharge	2 up to 10kV
Voltage increment resolution	1 volt steps
Contact discharge repetition interval	0.05 to 30s
Discharge detection	every pulse or real discharges only
Discharge counter	1 to 29999
Discharge polarity	positive, negative and alternating
Holding time	5s
Programmable parameter ramps	voltage, polarity
Discharge trigger	manual or automatic

EFT

Voltage range	0.25 up to 4.4kV
Source impedance	50ohm
Pulse front time at 50ohm	5ns
Pulse duration at 50ohm	50ns
Spike repetition frequency	up to 1MHz
Programmable parameter ramps	voltage, spike frequency, burst duration, synchronisation
Spike distribution	IEC burst pattern and random

CWG

Voltage range	0.25 up to 6kV
Current range	0.125 up to 3kA
Source impedance	2ohm
Pulse front time at open circuit	1.2µs
Pulse duration at open circuit	50µs
Pulse front time at short circuit	8µs
Pulse duration at short circuit	20µs
Pulse repetition	up to 20 pulses per minute
Programmable parameter ramps	voltage, synchronisation
Synchronisation on power lines	16Hz up to 400Hz

10/700µs

Voltage range	0.25 up to 6kV
Current range	16.6 up to 400A
Source impedance	15ohm + 25ohm
Pulse front time at open circuit	10µs
Pulse duration at open circuit	700µs
Pulse front time at short circuit	4µs (40ohm)
Pulse duration at short circuit	300µs (40ohm)
Pulse repetition	up to 4 pulses per minute

100kHz Ring Wave

Voltage range	0.25 up to 6kV
Current range	20 up to 500A
Source impedance	12ohm & 30ohm
Pulse front time at open circuit	0.5µs
Pulse oscillation frequency	100kHz
Pulse decay	60% first to second peak
Pulse repetition	up to 10 pulses per minute

Dips/Interrupts

Voltage range	0 up to 260Vrms
Frequency range	DC up to 400Hz with external supply
Rated current	16A for dips 0/100%
Interruption period	50µs up to 30s
Selectable dip range	0 up to 100% continuously 1)
Phase synchronisation	dips, interrupts & EUT supply

[1] 5A dips with standard variac. 16A dips requires VAR-EXT1000.

Selection Guide

Model	Circuit(s)
TRA2006 E-F-S-D	ESD, EFT, surge, dips
TRA2006 E-F-S-D-R	ESD, EFT, surge, dips, RING
TRA2006 E-F-S-R	ESD, EFT, Surge, RING
TRA2006 E-F-S-T-D	ESD, EFT, Surge, 10/700, dips
TRA2006 E-F-S-T-D-R	ESD, EFT, Surge, 10/700, dips, RING
TRA2006 E-F-S-T-R	ESD, EFT, Surge, 10/700, RING
TRA2006 E-S	ESD, surge
TRA2006 F-S	EFT, surge
TRA2006 F-S-D-R	EFT, surge, dips, RING
TRA2006 F-S-R	EFT, surge, RING
TRA2006 F-S-T	EFT, surge, 10/700
TRA2006 F-S-T-D-R	EFT, surge, 10/700, dips, RING
TRA2006 S-D-R	surge, dips, RING

Accessories and Options

CDN2000-06-32

CDN2000-06-32 for Three Phase Coupling

Add three phase capability with automatic or manual three phase coupling networks. The CDN2000A-06-32 and CDN2000-06-32, can be used for EFT, CWG surge and ring wave. Coupling path selection is either automatic under software control, or manual on the CDN front panel. All coupling networks fulfill the requirements laid down in the IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-12 (ring wave) and ANSI C62.41 standards.

280V Lx to N/PE, 480V Lx-Lx, 480V Lx/N-PE

OPTION 480V / CMC enables coupling according to ANSI C62.41 L1+L2+L3+N to PE.

CDN2000-06-63

CDN2000A-06-63 for Three Phase Coupling

Add higher current three phase capability with automatic coupling network CDN2000A-06-63. This can be used for EFT, CWG surge and ring wave. Coupling path selection is automatic under software control. This coupling network fulfills the requirements laid down in the IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-12 (ring wave) and ANSI C62.41 standards.

280V Lx to N/PE, 480V Lx-Lx, 480V Lx/N-PE

CDN-A-3P100-480 F / F-S for 100A three Phase Coupling

Three phase CDN with line voltages L to N/PE=280V and L to L=480V, line current 100A per phase. Automatic coupling path selection for EFT or EFT and SURGE controlled by TRA2000, TRA2004, TRA2006, TRA3000.

CDN-A-3P100-480 F-S

CDN-A-3P100-690 F / F-S for 100A three Phase Coupling

Three phase CDN with line voltages L to N/PE=398V and L to L=690V, line current 100A per phase. Automatic coupling path selection for EFT or EFT and SURGE controlled by TRA2000, TRA2004, TRA2006, TRA3000 and MIG0603INx.

CDN2000-06-25 Three Phase Coupling

CDN2000-06-25 can be used for Combination wave, Ring wave and EFT testing. With an EMC PARTNER oscillatory wave tester, power and up to four data lines using the 100kHz and 1MHz oscillatory waves can be tested according to IEC61000-4-18.

CDN2000-06-25

CN16-450C

Single phase CDN for superimposing surge and EFT into power lines. EUT power supply up to 16A at 115V 400Hz. For use ONLY with TRA2004 or TRA2006.

CN16-450C

CN2000TT MC

Test pistol for direct current injection of surge and 10/700µs according to IEC 61000-4-5. Cable length 1.5m with MC plugs. The test pistols can be used together with MIG system equipped with MC plug outputs on front panel or networks (NW).

CN2000TT MC

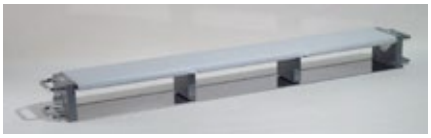
ESD2000

ESD discharge network to fulfill IEC 61000-4-2 requirements. For full details, please refer to brochure “ESD Testers”.

ESD2000

CN-EFT1000

Capacitive coupling clamp 100ohm according to IEC 61000-4-4 including 1m coax cable with BNC connectors.



CN-EFT1000

VERI50EFT

50ohm termination with high voltage BNC connector and integrated divider for EFT calibration / verification in accordance with IEC 61000-4-4 Ed2.

VERI50EFT

VERI1KEFT

1kOhm termination with high voltage BNC connector and integrated divider for EFT calibration / verification in accordance with IEC 61000-4-4 Ed2.

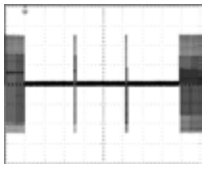
VERI1KEFT

CN-BALUN

Balanced/unbalanced transmission line transformer for EFT and 1MHz damped sine according to ANSI/IEEE C.37.90. Including coaxial cable with HV-BNC plugs (3x 0.5m), test tip + HV-BNC adapter (1 red, 1 black) and HV-BNC connector (2x).

CN-BALUN

Example of interrupt capability



TRA OPTION TEST 3.2

TRA2000 extension for special burst and dips/interrupts according to IEC 62052-11 and Indian standard 13779.

Three bursts of 1s duration within a 10 minute period.

Three interruptions lasting one second each with 50ms spacing, in accordance with IEC 62052-11 annex B.

ADAPTER EFT-CDN

Adapter cable which enables EFT impulses to be measured at the output of either a single or three phase CDN as required by IEC 61000-4-4 Ed.2.

CDN-UTP

CDN-UTP

The CDN-UTP is a sophisticated coupling and de-coupling network for superimposing surge impulses on balanced communication lines in accordance with IEC 61000-4-5 (Figure 12: unshielded symmetrical interconnection lines), ITU-K20, K21 and FCC part 68.

It is designed for 1.2/50µs and 10/700µs pulses up to 6.6kV.

CDN-UTP is also available with 4 pairs (8 lines) as the CDN-UTP8 version.

CDN-KIT1000

CDN-KIT1000

Surge coupling-decoupling network for data lines according to IEC 61000-4-5. Comprises one universal coupling module, one low frequency and one high frequency decoupling module.

OPTION NW-TRA-RAIL

NW-TRA-RAIL

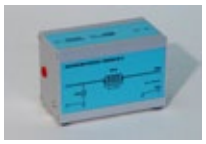
Applicable standards are IEC 60571 Ed. 2.0b, EN 50155 and RIA12.

TRA2000 and option NW-TRA-RAIL fulfill the waveform A impulse requirement.

Waveform A: 5/50µs (1.8kV), Zout 100ohm.

In combination with the ESD3000DM8 which generates the higher level waveform B impulse.

DN2000-22-5



DN2000-22-5

Decoupling module for IEC 60255-22-5 applications. 20mH inductance, 275V varistor to protect auxilliary equipment.

CN2000-22-5

CN2000-22-5

Coupling module for IEC 60255-22-5 applications. 40ohm resistor and 0.5µF capacitor for coupling surge.

VAR-EXT1000

VAR-EXT1000

External 16A variac module extends the internal capability for higher powered EUTs.

VERI-DIPS

VERI-DIPS

Measuring set for calibration/verification of the EUT inrush current.

NW16S

AC and DC voltage tests can be performed by adding the NW16S voltage source. Tests can then be performed for
- continuous mode (with 2 ranges up to 1V and up to 30V)
- short duration mode (1s up to 10V and up to 300V)

Two coupling networks are available: CN16 for powerlines and CN16T for telecom lines.

NW16S

CN16 and CN16T

Coupling networks for power lines and telecom lines. Use with NW16S.

CN16

PFS

PFS extends the Transient Test System to include three phase testing of AC and DC interrupts up to 480V and 32A in accordance with IEC 61000-4-34.

Available with different current ratings:
- PFS32 for interruptions up to 32A per phase
- PFS63 for interruptions up to 63A per phase
- PFS75 for interruptions up to 75A per phase

SRC

SRC extends the Transient Test System to include three phase testing of AC dips up to 480V and 32A in accordance with IEC 61000-4-34. Requires one RFS unit.

Available with different current ratings:
- SRC32 for dips up to 32A per phase
- SRC63 for dips up to 63A per phase
- SRC75 for dips up to 75A per phase

TRA2000 with PFS32 and SRC32

MF1000-1, MF1000-2 and MF1000-3

Applicable standards are IEC 61000-4-8 for a.c. and IEC 61000-4-9 for impulse magnetic fields.

Antenna	Coil dimensions	AC magnetic fields (50/60Hz)	Impulse magnetic fields (8/20µs)
MF1000-1	1m x 1m	1 up to 130A/m	0.1 up to 1.5kA/m
MF1000-2	1m x 2.6m	1 up to 110A/m	0.1 up to 1.1kA/m
MF1000-3	1m x 1m	0.3 up to 1kA/m	

MF1000-1
MF1000-2
MF1000-3

NW-K44PC

Power contact network for telecom testing in accordance with ITU-T K44, K20, K21. For use with DIPS circuit of TRA2000x.

TRA OPTION NW-K44PI

Power induction network for telecom testing in accordance with ITU-T K44, K20, K21.

Requires NW-K44PC.

NW-K44 PC with TRA OPTION NW-K44PI

PCPI160E

Power contact current limiting resistor network for telecom testing in accordance with ITU-T K44, K20, K21.

For use with NW-K44PC.

PCPI160E
(one of two equal units)

DIPS100E

DIPS100E

100ohm non-inductive resitor for calibration of dips/interrupts switching times.

PS3

PS3

Easy to use power supply for common voltage/frequencies. Output selected between 230V/50Hz, 115V/60Hz, 230V/16.7Hz and 115V/400Hz. 3000W capability.

PS3

PS3SOFT-EXT

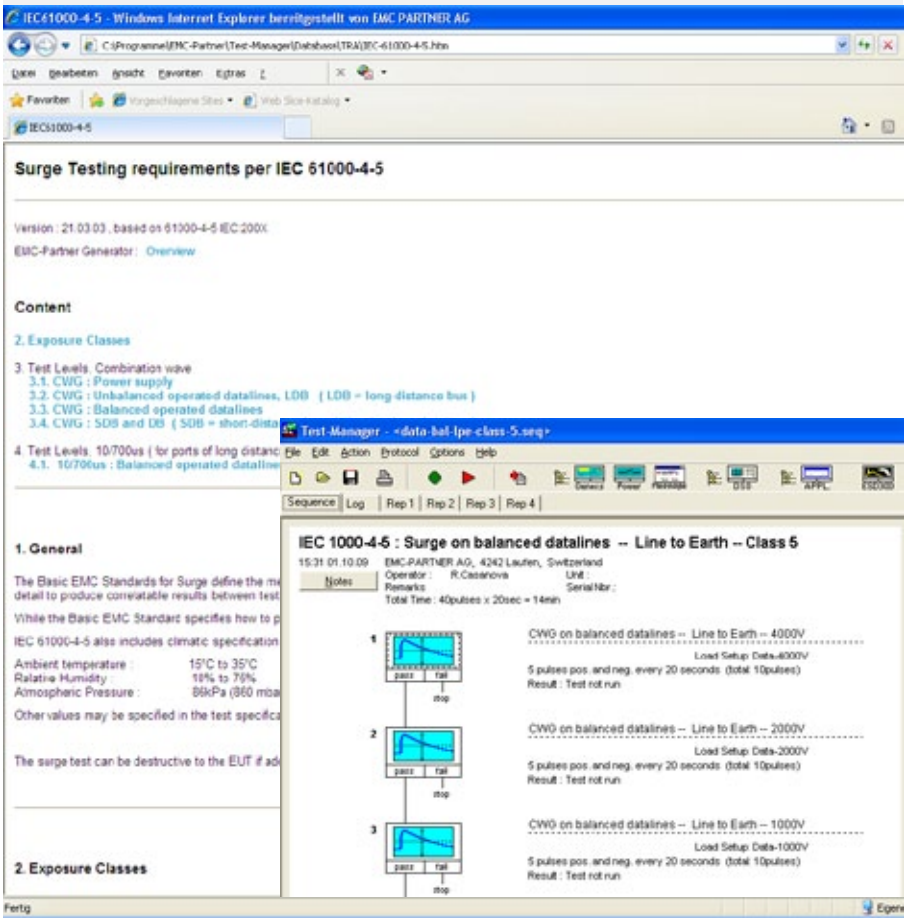
PS3SOFT-EXT extends PS3 for applications such as IEC 61000-4-28 and magnetic field at 16.7Hz.

Software

Remote control from a PC requires the OPTICAL LINK and one of the following software packages:

- GENECS is a relatively simple program that reproduces generator front panel functions on a PC. In addition to remote programming and control of the generators, test report information is available to word processing or other evaluation programs such as EXCEL. GENECS is supplied with each instrument or downloaded free of charge from the EMC PARTNER website. Firmware can be updated using the serial link provided.
- TEMA Software: Comfortable control of EMC PARTNER generators from a PC. Includes also control for ESD3000 and MIG2000 systems. Generates an enhanced level of test report.

Predefined test routines



EMC PARTNER's Product Range

The Largest Range of Impulse Test Equipment up to 100kA and 100kV.

Immunity Tests

Transient Test System can be used to performs all EMC tests on electronic equipment. ESD, EFT, surge, AC dips, AC magnetic field, surge magnetic field, common mode, damped oscillatory and DC dips tests are available as stand-alone or combined test instruments. A large range of accessories for different applications is available: three phase couplers up to 690V/100A, telecom and data line couplers, verification sets, magnetic field coils. Immunity test systems fulfills IEC and EN 61000-4-2, -4, -5, -8, -9, -11, -12, -16, -18, -29.

TRA3000 and ESD3000 ideal for CE testing
Easily extended to meet other applications

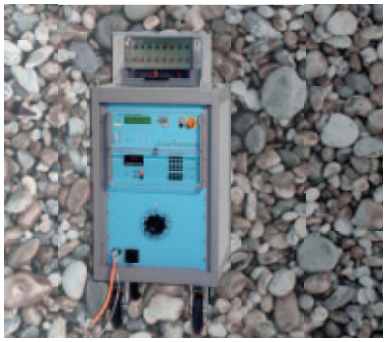
Lightning Tests

A range of test equipment and accessories for aircraft, military and telecom applications. Complete solutions including all hardware and software to meet the requirements of RTCA / EUROCAE DO160 / ED14 for indirect lighting on aircraft systems, MIL-STD-461 tests CS106, CS115, CS116, for military vehicles, ITU-T .K44 basic and enhanced tests for impulse, power contact and power induction, FCC part 68 for telecom equipment testing.

MIG2000-6 – a flexible solution for military and avionic applications

Component Tests

Modular impulse generators (MIG) for transient component testing on: varistors, gas discharge tubes (GDT), surge protective devices (SPD), X Y capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc. Manual or fully automated solutions are available up to 100kA (8/20us) and 144kV (1.2/50us).



MIG1212CAP – an automatic 8 bank capacitor test system

Emission Measurements

One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark. HAR1000 uses a novel techniques to deliver clean power source for the EUT in a compact and lightweight form. The system includes all hardware and software including line impedance networks, control and evaluation software. A basic 1-phase system can be easily extended to 3-phase by adding 2 further phases . HARCS Immunity software further expands the system by addidng interharmonic tests, voltage variation and ripple on DC tests. Complies with IEC / EN 61000-3-2, -3 IEC / EN 61000-4-13, -14,

HAR1000-3P and HARCS software a complete test system

System Automation

As addition to the basic generators, a range of accessories are available to enhance capability. Test cabinets, test pistols, adapters and software, simplify interfacing with the EUT.

PS3 programmable source is an EMC hardened supply for frequencies form 16.7Hz to 400Hz. Frequency variation tests can be made using the PS3-SOFT-EXT. Complies with IEC / EN 61000-4-28

PS3 - programmable source ideal for EMC applications

For further information please do not hesitate to contact EMC PARTNER's representative in your region. You will find a complete list of our representatives and a lot of other useful information on our website:

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Version January 2012. Subject to change without notice.