

## 1.2 Overview of the TRANSIENT-2000 test system

### 1.2.1 The TRANSIENT-2000 and its versions

The Tester TRANSIENT-2000 simulates transients of different interference sources. such as: indirect lightning in electronic systems, human body electrostatic discharges, switched inductance (Burst), power supply interruptions and variations. The test system TRANSIENT-2000 fulfils all requirements of the IEC basic standards IEC 61000-4-2 (ESD); 61000-4-4 (EFT); 61000-4-5 (SURGE) as option available 10/700  $\mu$ s Impulse; 61000-4-11 (Interruption and Variations), and with accessories 61000-4-8 (Magnetic field 50/60Hz) and 61000-4-9 (Magnetic field SURGE) and 61000-4-29d dips and interruption on d.c.

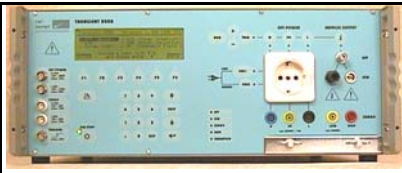
If not all transient test are needed, the TRANSIENT-2000 tester is also available in various versions, with the possibility to upgrade the tester later to a full TRANSIENT-2000 test system.

The upgrade must be carried out in Switzerland at EMC PARTNER AG. The upgrade includes a verification of the Tester TRANSIENT-2000. The best occasion for an upgrade is together with a annual inspection or verification.

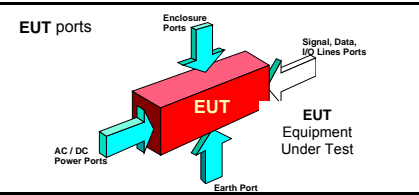
The TRANSIENT-2000 contains a single-phase coupling / de-coupling network, which allows a controlled superposition of the transients onto a power supply line. All transients are generated at the same EUT power output, therefore a true single port test is possible. The TESTER 2000 allows the automated switching of the coupling paths and the programming of large range of test sequences.


The tester TRANSIENT-2000 is a stand-alone equipment for automated EMC test without a PC.

### 1.2.2 Which system configuration is needed for a particular test?



**Test System And Standards**





In addition we offer for carrying out EMC test and measurements in your company:

IEC Standards	Max. Values of EMC-PARTNER Testers	Tester type	AC/DC	Signal Telecom	Signal	Earth	Enclosure	Calibration	Test set-up	Control via PC
1000-4-2 ESD	CD* 8kV; AD* 15kV	TRA-2000	-	-	-	-	1+2 (13)	9,19	20 (21)	14 (16, 23)
1000-4-4 EFT	4,4 kV; 1MHz	TRA-2000	1 (12)	1+3	1+3	1+3	-	10,19	20 (21)	14 (16, 23)
1000-4-5 SURGE	CWG 4,1 kV 2 kA	TRA-2000	1 (12)	1+16	1+4	1+5	1+5	19	-	14 (16, 23)
1000-4-8 a.c. MF	160A/m, 1050A/m	TRA-2000	-	-	-	-	1+7+8+15 (22)	-	22	14 (16, 23)
1000-4-9 Surge MF	1600 A/m	TRA-2000	-	-	-	-	1+7+8 (22)	-	22	14 (16, 23)
1000-4-10 Oscil. MF	120 A/m	MIGOS-OM	-	-	-	-	1+7+8 (22)	-	22	-
1000-4-11 DIPS	16 A different levels	TRA-2000	1 (6, 12)	-	-	-	-	11,19	-	14 (16, 23)
1000-4-11 Variation	5 A different levels	TRA-2000	-	-	-	-	-	-	-	-
1000-4-12 Ring	6 kV	MIG0603IN4	1 (12, 24)	-	-	-	-	19	-	14 (16, 23)
1000-4-12 Oscillation	3 kV, 1MHz, 100kHz	MIGOS-OSI	1 (24)	-	-	-	-	-	-	-
1000-4-13 Harmonics	16 A, 230 V	HAR-1000	1	-	-	-	-	19	-	14 (16)
1000-4-14 V-variation	16 A, 230 V	HAR-1000	1 (6, 12)	-	-	-	-	19	-	14 (16)
1000-4-17 Ripple on d.c.	16 A, 200V d.c.	HAR-1000	1 (6, 12)	-	-	-	-	19	-	14 (16)
1000-4-16 Common Mode	300 V a.c., 300 V d.c.	TRA-2000	-	1+17	1+17	-	-	19	-	14 (16, 23)
1000-4-29 DIP on d.c.	16 A, 110V	TRA-2000	1	-	-	-	-	19	-	14 (16, 23)

N°	Description / Accessories	N°	Description / Accessories	N°	Description / Accessories
1	See colon "Tester type"	9	Measuring Target ESD 2 $\Omega$	17	NW16S, CN16, CN16T
2	ESD discharge circuit, Relay, Finger	10	Measuring set EFT 50 $\Omega$ / 1 k $\Omega$	18	Coupling Kit Telecom CDNKIT1000T
3	Coupling clamp CNEFT1000	11	Measuring-set DIPS (inrush current)	19	Certificate and Protocol
4	SURGE coupling kit CDNKIT1000	12	Three phase coupling CDN2000-06-32	20	Connection set
5	Test tip CN-TRA	13	ESD stand	21	Test set-up accessories
6	External Variac VAREXT-1000 (16/32A)	14	GENECS to TRA, HARCS-Immunity to HAR	22	Stand to MF1000-1 or MF1000-2
7	Antenna for magnetic field MF1000-1 1x1m	15	Antenna for magnetic field MF1000-1 1x1m, 3s	23	Fibre Optic link
8	Antenna for magnetic field MF1000-2 1x2.6m	16	EUT Monitor for EUT failed control	24	Three phase coupling CDN2000-06-25

\*CD = Contact Discharge \*AD = Air Discharge

### 1.3 Technical data of the TRANSIENT-2000

#### 1.3.1 Switched inductance EFT (IEC 61000-4-4)

Voltage waveform into 50 $\Omega$ :	Impulse Output		Chap 14.1.1 IEC 61000-4-4
Risetime	5 ns	$\pm 30\%$	
Half time value	50 ns	$\pm 30\%$	
Voltage waveform into 1000 $\Omega$ :			
Risetime	5 ns	$\pm 30\%$	
Half time value	100 ns	- 50 ns	+ 100 ns
Adjustable voltage range	250 V to 4400 V		
Voltage amplitude into 50 $\Omega$	125 V to 2000 V	$\pm 10\%$	
Voltage amplitude into 1000 $\Omega$	250 V to 4000 V	$\pm 20\%$	
Source impedance	50 $\Omega$	$\pm 10\%$	
Spike frequency	1 kHz up to 1 MHz		
Maximum Spikes per seconds	8'000 at 1000 V		1000 at 4000 V
Burst duration	0,001 ms up to 20 ms		
Burst repetition	1 ms up to 1000 ms		
Polarity	positive / negative		
Ramps	-Voltage -Spike frequency -Synchronisation -Burst duration		
High voltage output	10 nF decoupled	max. 450 V ac	

#### 1.3.2 Coupling / De-coupling Network EFT

Maximum EUT power supply voltage	260 V ac 50/60 Hz		
Maximum allowed continuous current	16 A		
Spike waveform superimposed onto the lines of the EUT power supply	within the tolerances as above		Chap 14.1.1 IEC 61000-4-4
damping between output and input of the CDN	better 30 dB		
Coupling paths:	L-GND; N-GND, PE-GND, L+N+PE - GND L+N - GND; L+PE - GND; N+PE - GND		

**1.3.3 Electrostatic discharges ESD (IEC 61000-4-2)**

Energy storage capacitance	150 pF	± 10%	
Discharge resistance	330 Ω	± 10%	
Charging resistance	54 MΩ		
holding time (drop to 95%)	better than 5 s		
Current rise time, 2 Ω load	0,7 to 1 ns		See 14.1.2 IEC 61000-4-2
Definition of current waveform:			
Current amplitude at 30 ns	4 to 16 A	± 30%	
Current amplitude at 60 ns	2 to 8 A	± 30%	
Voltage range „air discharge“	2 to 15 kV	± 10%	
Voltage range „contact discharge“	2 to 10 kV	± 10%	
First current amplitude into 2 Ω „contact discharge“	7,5 to 30 A	± 10%	
Polarity	positive / negative; automatic switchover		
Number of discharges Detection of the number of discharges	-preselectable -count „every pulse“ -count „discharge only“. Only the impulses whereas the voltage of the discharge capacitor tropes lower then 10% of the charging voltage are counted.		1 to 29'999
Ramps	voltage amplitude changes from shot to shot, alternate polarity		
Reporting	test sequence with the number of discharges -Voltage amplitude -Polarity		
Discharge modes:	-Air discharge -Contact discharge		
Repetition of the discharges	0.05 up to 30 s Single discharge „Man“		

### 1.3.4 Lightning and switching actions SURGE (IEC 61000-4-5)

Waveform at no load :	Impulse output		See 14.1.3
Front time	1.2 $\mu$ s	$\pm 30\%$	
Time to half value	50 $\mu$ s	$\pm 20\%$	
Waveform at short circuit:			
Front time	8 $\mu$ s	$\pm 20\%$	
Time to half value	20 $\mu$ s	$\pm 20\%$	
Preselectable voltage range	220V to 4100 V		
Open circuit output range	250 V to 4000 V	- 0%; +10%	-
Short circuit output current	125 A to 2000 A	- 0% + 10%	
Output impedance Umax / Imax	2 $\Omega$	$\pm 0.25 \Omega$	
Polarity	positive / negative / altn		
Ramps	-Voltage -Polarity -Synchronisation		
High voltage output "low"	maximum voltage between „low“ and earth 260 V ac		
Time between successive shots	3 s		5s at 4000 V

### 1.3.5 Coupling / De-coupling Network „CDN-SURGE“

Maximum allowed voltage phase neutral	260 V ac 50/60 Hz	16A	
Coupling path phase- earth	9 $\mu$ F + 10 $\Omega$	(L-PE)	
Coupling path neutral - earth	9 $\mu$ F + 10 $\Omega$	(N-PE)	
Coupling path phase - neutral	18 $\mu$ F	(L-N)	
Coupling modes:	L-N; L-PE; N-PE, automatic coupling path switching		

**Attention !** The CDN-SURGE 1,2 / 50; 8 / 20  $\mu$ s is designed for maximum power consumption at 260V rms 50/60Hz and a coupling capacitance of 18  $\mu$ F.

If using EMC PARTNER coupling de-coupling network other than, the maximum power dissipation of the TRANSIENT-2000 must be considered. Power Line voltages higher than specified can destroy the impulse

forming devices in the TRANSIENT-2000. Please contact EMC PARTNER AG or a representative before using a unknown coupling network.

**1.3.6 Voltage interruption and Variation (IEC 61000-4-11) with internal Variac**

Voltage range	0 to 260 V	EUT Power	See 4.2
Frequency range without variac	DC up to 400 Hz		external Source
Frequency range with variac involved	48 Hz to 60 Hz		external Source
Nominal current	16A		
Interruption with internal variac and linear load	maximum 12 A maximum 16 A		< 5s < 300 ms
Inrush current	500 A Peak	- 0%, +30%	See 14.1.4
Interruption time	50 µs to 30 s		phase angle selectable
Amplitude of the interruptions	continuously selectable from 0 to 100 %		IEC: 0 %, 40 %, 70 %
Phase angle for turn ON and OFF of the EUT selectable	0 to 360°	± 5°	
Voltage variation with the internal variac	0 to 110 % maximum. 5A	± 20%	2 s to 30000 s
Voltage variation with external variac	0 to 110 % maximum. 16 A	± 20%	2 s to 30000 s
Less than 1 period  More than one period d.c. interruption	Interruption within one period. Input as angle  Interruption longer then one period. Input in ms  Input in ms		
Ramps	-Voltage -Synchronisation angle -Interruption time		
Interruption for all kind of loads UT= voltage at EUT Power 1	DIP 100 %	% UT 0 %	0 to 16 A



**For interruptions of 0 to 100% and 100% to 0% the internal Variac is not involved, therefore the test can be carried out up to 16 A. For interruption with UT =EUT Power 1 voltage not null, the internal variac limits the EUT power current. The maximum allowed current values are listed in the table on the next page. Please be aware that different types of loads influence the maximum current differently.**

**With internal Variac:**

Types of loads:		Variable power consumption maximum <b>2.6 kW at UT 230 V.</b> With reduction of the voltage the current is also reduced. Examples: Ohmic -, inductive -, capacitive -, mixed loads	Constant power consumption maximum <b>1,2 kW at UT = 220V.</b> With reduction of the voltage the current is increased. Example: switched power supply	voltage change in % of UT at current change 0 to 100 % UT= voltage at EUT Power 1
switching from	to			
UT	% UT	current range r.m.s	current range r.m.s	% of UT
100 %	0 %	0 to 16A	0 to 16A	0.7 %
100%	80%	0 to 10 A	0 to 5A	4%
100%	70%	0 to 9 A	0 to 6 A	4%
100%	40%	0 to 5 A	0 to 10 A	5%

Note: all values apply for switching time at %UT < 5 s

**1.3.7 Interruption and Voltage Variation IEC 61000-4-11 with external Variac**

Types of loads:		Variable power consumption maximum <b>3.7 kW at UT 230 V.</b> With reduction of the voltage the current is also reduced. Examples: Ohmic -, inductive -, capacitive -, mixed loads	Constant power consumption maximum <b>3,7 kW at UT = 220V.</b> With reduction of the voltage the current is increased. Example: switched power supply	voltage change in % of UT at current change 0 to 100 % UT= voltage at EUT Power 1
switching from	to			
UT	% UT	current range r.m.s	current range r.m.s	% of UT
100 %	0 %	0 to 16A	0 to 16A	0.7 %
100%	80%	0 to 12.8 A	0 to 20A	4%
100%	70%	0 to 11.2 A	0 to 23 A	4%
100%	40%	0 to 6.5 A	0 to 40 A	5%

Note: all values apply for switching time at %UT < 5 s

**1.3.8 DIPS circuit in accordance with IEC 61000-4-29 for d.c. power ports.**

Voltage range d.c.	20 to 110 V	EUT Power	
Current range	0 up to 16A		
Inrush current capability at 110 V	220A Peak	- 0%, +30%	See 6.1.1
Interruption time	1ms up to 29999 ms		
Rise and fall time at 100 Ohm load	between 1 µs and 50 µs		See 6.1

**IEC 61000-4-29 page 19:**

The use of a generator with higher or lower voltage/current capability is allowed provided that the other specifications are preserved. The test generator steady state power/current capability shall be at least 20% greater than the EUT power/current ratings.

**1.3.9 Measuring circuit, measuring outputs**

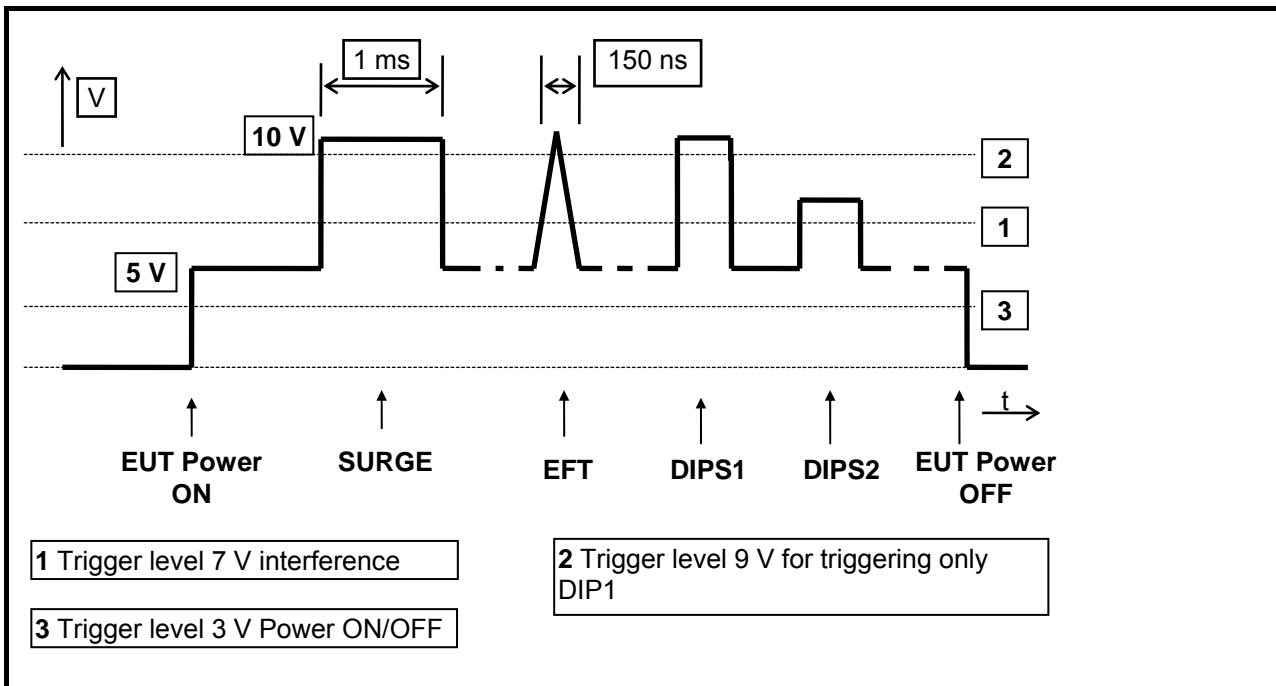
Monitor outputs for measuring equipment e. g. oscilloscope:

Outputs	Relations	Tolerances	Maximum values
SURGE Voltage	10 V equals 4000 V	5 %	4800 V
SURGE Current	10 V equals 2000 A	5 %	2400 A
EUT Power Voltage	10 V equals 400 V	3 %	480 V
EUT Power Current	10 V equals 100 A	5 %	500 A

Numeric measurements e.g. measuring values in the display and in the report.

Display	Range	Tolerances	
SURGE Voltage Peak value	0 to 5000 V	5 %	
SURGE Current Peak value	0 to 2500 A	5 %	
EUT Power Voltage (rms)	0 to 2500 V	3 %	
EUT Power Current (rms)	0 to 260 V	3 %	
	0 to 18 A	3 %	

**1.3.10 Trigger Output Levels**



### 1.3.11 Control

Set-up memory	Up to 15 memory places
Test sequences	the set-ups can be linked serially
Ramps	automatic linear variation of one parameter e.g. voltage, frequency etc.
Synchronisation on different power line frequencies	16, $\frac{2}{3}$ ; 40; 50; 60, Hz
Impulse release	Manual or automatic
Failure detection on EUT	-External Input EUT failed -Manual detection -Selectable limit value for impulse voltage and current for SURGE
Safety switching	Emergency stop Switch off the EMC Test and the EUT power
Control of an external variac	separate remote-control output
Test report	RS232 port for printer, Centronics
Control of external CDN	via RS 485 port

### 1.4 Mechanical dimensions

Tester -Type	Dimensions [mm]	Weight [kg]	Versions
	width x depth x height		
TRA2000	550 x 600 x 190	33	19" 4 UH
TRA2000-DIPS	550 x 600 x 190	20	19" 4 UH
TRA2000-EFT-ESD	550 x 600 x 190	20	19" 4 UH
TRA2000-DIPS-SURGE	550 x 600 x 190	30	19" 4 UH
TRA2000-EFT-ESD-DIPS	550 x 600 x 190	32	19" 4 UH
TRA2000-EFT-ESD-SURGE	550 x 600 x 190	27	19" 4 UH
TRA2000-SURGE	550 x 600 x 190	22.5	19" 4 UH

### 1.5 Power Consumption

The power line input is located on the rear side of the TRANSIENT-2000.

Voltage between phase and neutral	230 V ( 50 Hz ) 115 V ( 60 Hz )	± 10 % ± 10 %
Power consumption	Operation mode < 400 VA Standby < 50 VA Power OFF < 5 VA	( 230 V, 50 Hz ) ( 115 V, 60 Hz )

The tester TRANSIENT-2000 is shipped for a line voltage 230 or 115 V.

Following power cords can be ordered:

Europe ( CEE-7/VII )      UK ( BS-1363 )      Switzerland ( SEV Type 12 )      USA ( NEMA5-15P )