

Manual

For Operation



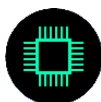
TSS 500 M2i B

Current Surge Simulator

10/1000 μ s

TSS 500M2i B is an intelligent solution offering exactly what you need for full-compliant immunity tests against transient surge phenomena. The distinct operation features, convenient DUT connection facilities, a clearly arranged menu structure and display philosophy as well as the pre-programmed standard test routines make testing easy, reliable and safe.

Bellcore GR 1089

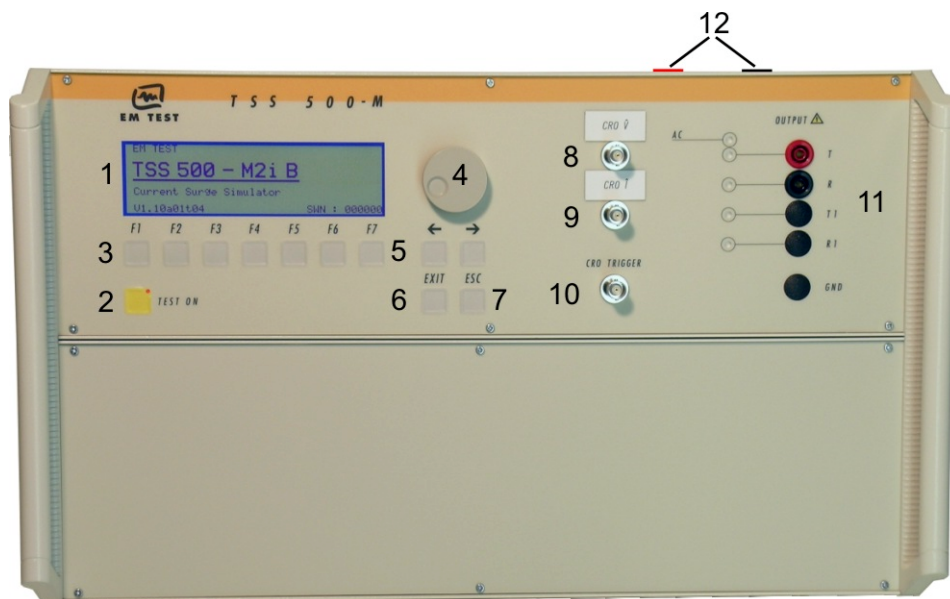


Contens

1.	Operating Functions	3
1.1.	Front view	3
1.2.	Rear view	4
2.	Operation	6
2.1.	Description of the menus	6
2.2.	Menu structure	6
2.3.	Main Menu	7
2.4.	Service	7
2.5.	Setup	8
2.6.	CSURGE Menu	9
2.7.	Quick Start	10
2.8.	Test Routines	11
3.	Test Equipment TSS 500 M2i B	12
3.1.	Equipment design	12
3.2.	Control Unit	12
3.3.	High voltage unit	13
3.4.	DUT test box	13
3.5.	Test setup	13
4.	Pulse Verification	14
4.1.	Verification setup	14
4.1.1.	Verification of the Surge pulse short circuit current	14
4.2.	Specification of the wave shape	14
5.	Technical data	15
5.1.	SURGE Current Requirements as per Bellcore GR 1089	15
5.2.	General Specifications	16
5.3.	Test Box	16
6.	Maintenance and service	17
6.1.	General	17
6.1.1.	Test set- up	17
6.2.	Calibration and verification	17
6.2.1.	Factory calibration	17
6.2.2.	Guideline to determine the calibration period of EM Test instrumentation	17
6.2.3.	Calibration of Accessories made by passive components only:	17
6.2.4.	Periodically In-house verification	17
7.	Delivery Groups	18
7.1.	Basic equipment	18
7.2.	Accessories and options	18
8.	Appendix	19
8.1.	Declaration of CE-Conformity	19
8.2.	TSS 500 M2i B – Overview	20
8.3.	U/I characteristics	21
8.3.1.	Diagram 110A range	21
8.3.2.	Diagram 220A range	21

1. Operating Functions

1.1. Front view



- | | | | |
|---|-------------------------|----|---|
| 1 | Display | 7 | Escape |
| 2 | "Test On" | 8 | CRO U (surge) |
| 3 | Function keys "F1..F7" | 9 | CRO I (surge) |
| 4 | Knob (Inc / Dec) | 10 | CRO trigger output ↑ 5V |
| 5 | Cursor keys "←" and "→" | 11 | HV output frontside (parallel to the output on the top) |
| 6 | Exit | 12 | HV output test box |

1 Display

All functions and parameters are displayed (8 lines with max. 40 characters).

2 Test On

By pressing the key "Test On" the test procedure is initiated with the preselected parameters. The red LED indicates the trigger of a burst event.

3 Function keys "F1 .. F7"

Parameters and functions, displayed in the lowest line, can be selected with the related function key.

4 Knob (Inc / Dec)

The knob increments or decrements test parameters with a numeric value or selects from a list of parameters.

5 Cursor keys

Parameters and functions can be changed on-line. The selection of these parameters is realized with the cursor moving to the left or to the right.

6 Exit

Pressing of the Exit function will cause a reset of the firmware. This is only possible if no test routine is running.

7 ESC

When pressing the ESC button the user moves back one page in the menu.

8 BNC CRO U

At the BNC output the residual voltage pulse across the suppressor can be measured. Dividing ratio is 100:1 (5V at 500V pulse).

9 BNC CRO I

At the BNC output the current pulse of the generator can be measured. Dividing ratio is 10:1 (5V at 50A pulse).

10 BNC - CRO Trigger

At the BNC output the generator trigger pulse is available (+5 V rectangular). This output can be generally used as oscilloscope trigger output and is synchronous to the surge impulse

11 HV output frontside

This HV output is in parallel to the output on the top of the TSS 500 M2i B. This output can be used if the plugs on the frontside are more practically.

12 HV output testbox

HV output on the Top cover for plug in the test adapter.

1.2. Rear view



- | | |
|------------------------------|------------------------------|
| 1 Sync input | 5 Safety circuit |
| 2 Reference earth connection | 6 EXT trigger input |
| 3 Ventilation | 7 Mains selector 115V / 230V |
| 4 Warning lamp | |

1 SYNC input

An ac voltage to which the events shall be synchronized is connected to this input. If no voltage is available the tests are started automatically in asynchronous mode. The maximum input voltage is 250VAC/400Hz.

2 Reference earth connection

The generator has to be connected to the reference earth plane of the test set up. The connection at the rear part of the generator is an alternative to the grounding point at the front panel

3 Ventilation

After long term duration tests the generator should keep on running for some minutes to cool down the system.

4 Warning lamp

A voltage free contact is available for external warning indications (warning lamp). The signal is generated after pressing TEST ON.

5 Safety circuit

The test can only be started if the security circuit is closed. If the circuit is opened during a running test the simulator will be switched off immediately.

6 External trigger

One single surge pulse can be released. Trigger level 1-15V positive going.

7 Mains selector

Selection 115/230V



- | | |
|--------------------------------------|--------------------------------|
| 8 Power on switch | 11 Parallel interface IEEE 488 |
| 9 Fuse for high voltage power supply | 12 Remote Control connector |
| 10 Serial interface RS232 | 13 Fail detection |

8 Power on switch

The switch is part of the mains filter. Mains fuses are part of the filter.

9 Fuse F3 of the high voltage power supply

The high voltage power supply unit is protected against overload by this fuse. In case that no pulses are generated anymore please check the fuse.

10 Serial interface

RS232 interface with a 9 pin connector.

11 Parallel interface

IEEE-488 interface with IEEE connector.

12 Remote control connector

External coupling devices are controlled via this remote control connector.

13 Fail detection FAIL 1 (TEST STOP)

The BNC input FAIL 1 can be used for failure detection at the EUT. If the input is set to ground (chassis) the burst generator will be stopped and the actual test routine is finished. It is not possible to continue this test routine.

A complete restart of the routine is necessary.

A message of FAIL 1 is indicated in the LCD display as well as in the ISM software.

Fail detection FAIL 2 (TEST PAUSE)

The BNC input FAIL 2 can be used for failure detection at the EUT. If the input is set to ground (chassis) the actual test routine is paused as long as the low level signal is available at the FAIL 2 input.

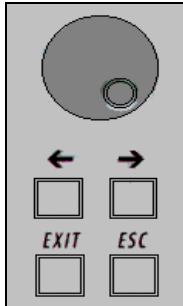
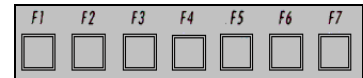
Without the low level signal the test procedure continues automatically.

A message of FAIL 2 is indicated in the LCD display as well as in the ISM software.

2. Operation

2.1. Description of the menus

The simulator is operated by an easy menu control system. Seven function keys are available to select parameters and functions. All functions are indicated on the display; max. 8 lines and 40 characters.



The selected parameter is blinking and can be changed by turning the knob (incr./decr.).

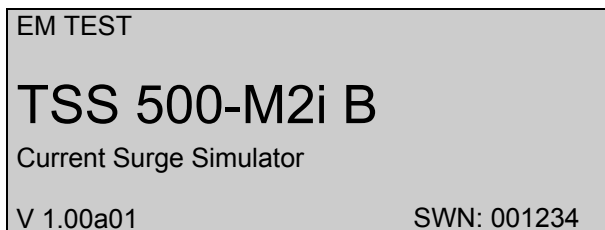
↔ : The digit to be changed can be selected with the cursor (**↔**).

- Setted values are direct indicated on the screen.

- Status on the bottom lines shows the desired status after pressing the function key.

ESC : ESC will take you back to the previous level in the menu and set the displayed values. The latest settings are stored automatically and will be recalled when the menu is selected again.

EXIT : The firmware will reset to the main screen.



The serial number and the version number SWN are used for traceability reasons. These numbers are listed in the test reports and calibration certificates. These numbers also are listed within the test reports generated by the ISM IEC software.

Start-up display example TSS 500M2iB

2.2. Menu structure

Level 0...4

Level 0	Level 1	Level 2	Level 3	Level 4
MAIN MENU F1 Current Surge 110A F2 Current Surge 220A F7 Service	CSURGE F1 Quick Start F2 Usual Test routine F3 Change voltage after n F4 Change Angle after n F5 Change polarity after n F7 Service	Quick Start F1 Start F2 Change F3 Continue	Start Start the test routine Change Select all parameters Continue Continue the test routine	
		Usual test routine F1 : F7 Store F1...Store F7	Usual test routine F1 Start F2 Change F3 Continue	
		Change xxx routine F1 : F7 Store F1...Store F7	Change xxx routine F1 Start F2 Change F3 Continue	
	Service F1 Adresses F2 Selftest F3 Setup F1 Print all	Service Adresses EM Test and URL Selftest Functions: Key, knob, test ON/OFF safety circuit Print all Print all settings to the RS 232 port	Service Setup F1 Change language F2 LCD backlighting F3 Interfaces F4 Beep F5 Timer	Change language Gem or English LCD backlighting On, Off or Auto Interfaces Select all parameters Beep Keyboard Beep on/off Countdown Beep on/off Timer Display of the TEST ON time

2.3. Main Menu

Level 0

MAIN MENU						
F1 : Current Surge 10/1000us up to 110 A						
F2 : Current Surge 10/1000us up to 220 A						
F7 : Service						
F1	F2	F3	F4	F5	F6	F7

F1, F2 Current Surge 10/1000 up to 110..220A

The user can select between two different current ranges for testing different types of components. The maximum current per range is specified under short circuit conditions and is generally adjusted by selecting the adequate charging voltage in the display of the generator.

F7 Service

Setup, self-test, addresses of EM TEST can be selected and displayed.

2.4. Service

All service functions are indicated in the display.

Level 2 (Overview)

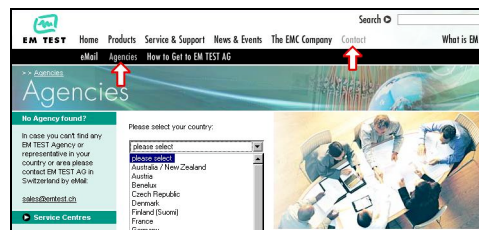
SERVICE						
F1 : Addresses						
F2 : Selftest						
F3 : Set-up						
F5 : Print all						
F1	F2	F3	F4	F5	F6	F7

F1 Addresses

The addresses of the EM TEST AG and the EM TEST GmbH are shown.

The addresses of all EM TEST sales agencies are listed on the EM Test web site of under :

www.emtest.com



F2 Selftest

Together with the user the software can test some parts of the equipment. The software will clearly explain the self-test procedure. The selftest routine tests the function of the Keys, Knob, Test ON/OFF and safety circuit.

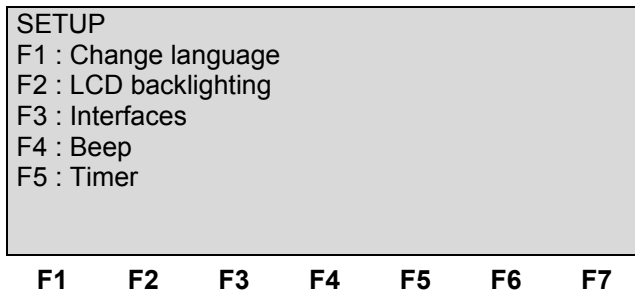
F3 Set-up

The firmfare will clearly explain the set-up procedure.

F5 Print all

With this all settings can be printed to a RS 232 printer.

2.5. Setup



F1 Change language

The user can chose between two languages, German and English. Future firmware will also include a French and an Italian version. The user can chose between two languages, German and English.

F2 LCD backlighting

With the use of F2 the backlighting can be switched on or off.

Additionally the **Auto Off** function can be programmed to switch off the backlighting after a defined time that the equipment has not been in operation (1 – 30) minBecause of the limited lifetime of LCD displays, approx. 10,000h this function should always be activated.

F3 Interfaces

This menu will help the user to define the status of the integrated serial and parallel interfaces, e.g. the baud rate of the RS 232 or the address of the IEEE interface.

F4 Beep

In the beep menu F1 is the selector for the keyboard-beep and F3 is the selector for the countdown-beep. The countdown-beep is released two seconds before a pulse will be released.

The indication that the test is finished is a 3 times beep and can not be switched off.

F5 Timer

Pressing of F5 will show the total operating time of the test equipment.

2.6. CSURGE Menu

Level 1

CSURGE (110A) (220A)						
F1 : Quickstart						
F2 : User Test routine						
F3 : Change voltage after n by dV						
F4 : Change Angle after n by dA						
F5 : Change Polarity after n pulses						
F1	F2	F3	F4	F5	F6	F7

F1 Quick Start

Easy and fast operation of the generator. All parameters can be adjusted during a running test routine.

F2 User Test routine

User test routine for simple tests without any iteration. All parameters can be adjusted and stored.

F3 Change Voltage after n by dV

The charging voltage V is changed from V1 to V2. After the preselected number pulses the test level is changed by ΔV until V2 is reached.

The same parameters as under Quick Start are selectable. For the limitation of the max. admissible repetition rate the higher value of V1 and V2 is valid.

F4 Change Angle after n by dA

The phase angle related to which the surge current pulse is released is changed from A1 to A2. After the preselected number of n pulses the actual phase angle is changed by ΔA until A2 is reached. The same parameters as under Quick Start are selectable.

F5 Change Polarity after n pulses

After the release of the preselected number of pulses the polarity is changed. The procedure always starts with positive polarity and changes than to negative. The same parameters as under Quick Start are selectable.

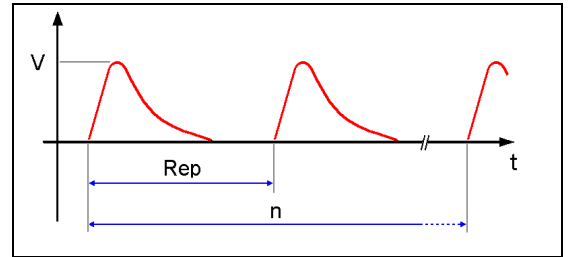
The following short terms will be used within the next pages:

Vch	Charging voltage
+/-	Polarity of the generated pulse
rep	Repetition rate of the generated pulses
A	The current surge is related to the phase angle A of the signal on the sync input.
tri	Trigger mode; AUTO, MAN or EXT
n	Number of pulses to be generated

2.7. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.

CSURGE (110A) QUICK START						
Vch = 1000V	A =	0 dgr				
+/- = +	rep =	30s				
tri = Auto	n =	endl				
START CHANGE			Print			
F1	F2	F3	F4	F5	F6	F7



Press **START** and the test routines begin to work.
Press **CHANGE** and the actual parameters can be changed.

All function keys except F2 (manual trigger) can **Stop** the test routine.

Page 3 (Start)

CSURGE (110A) QUICK START						
Vch = 1000V	A =	0 dgr				
+/- = +	rep =	30s				
tri = Auto	n =	endl.				
Vch = 1000 V	U = + 1000V	COUNTER				
STOP 24 s	I = + 0.0A	0000043				
F1	F2	F3	F4	F5	F6	F7

The user can select the parameter with the related function key and can change the value with the knob. The cursor allows the user to define the value of the digit which should be changed (fast or slow change).

Pressing the ESC button will bring the user back to the previous level from where the test can be restarted with new levels. After restart the actual test time is displayed. All functions keys except F2 (MAN TRIGGER) can stop the test routine. The latest setting will be displayed.

Any pressing of a function key will indicate the functions START, CHANGE or CONTINUE. F3 will continue the same test routine. Also the test time will continue running. If the user selects at first START or CHANGE the test will be stopped completely.

Page 3 (Change)

CSURGE (110A) QUICK START						
Voltage	V	:	50V	-	1200V	
Angle	A	:	0 dgr	-	360 dgr	
Events	n	:	1	-	30000	
Repetition	Rep	:	3s	-	999s	
Polarity	+/-	:	+, -, ALT			
Trigger	tri	:	Auto, Man			
V	A	+/-	Rep	tri	n	
50	0	+	3	Auto	00001	
F1	F2	F3	F4	F5	F6	F7

Press CHANGE and the test parameters can be changed. Select the desired parameter with the related parameter and the available range is displayed. Change the value by turning the front panel knob. The cursor allows the user to define the digit to be changed (fast or slow change).

Note: At polarity setting ALT it is necessary to double the number of impulses. Example n=2 => one impulse positive and one impulse negative.

2.8. Test Routines

The user can program, save and recall his own specific test routines. The next pages shows the selection of the functions.

CSURGE (110A) USER TEST NEBUE						
F1 : Store F1	F5 : Store F5					
F2 : Store F2	F6 : Store F6					
F3 : Store F3	F7 : Store F7					
F4 : Store F4						
F1	F2	F3	F4	F5	F6	F7

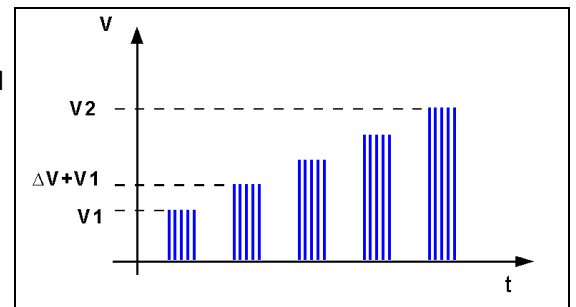
After selection the last used test parameters will be indicated on the display.

F2 User Test Routines

The software controls user test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

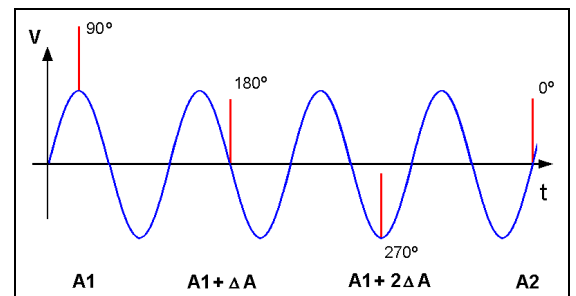
F3 Voltagesweep Change test level V after n pulses by ΔV

The test voltage V is changed from V1 to V2. After the preselected number of pulses the test level is changed by ΔV until V2 is reached. The same parameters as under Quick Start are selectable. For the limitation of the max. admissible repetition rate the higher value of V1 and V2 is valid.



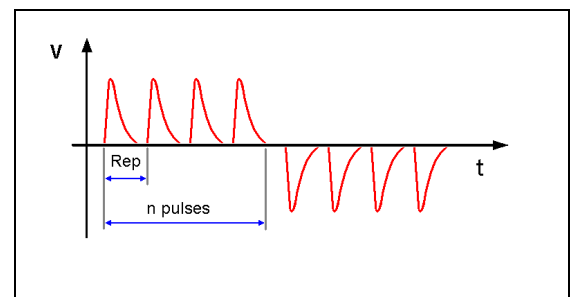
F4 Phaseangle Change the phase angle A after n pulses by ΔA

The phase angle related to which the surge pulse is released is changed from A1 to A2. After the preselected number of n pulses the actual phase angle is changed by ΔA until A2 is reached. The same parameters as under Quick Start can be selected.



F5 Polarity Change polarity after n pulses

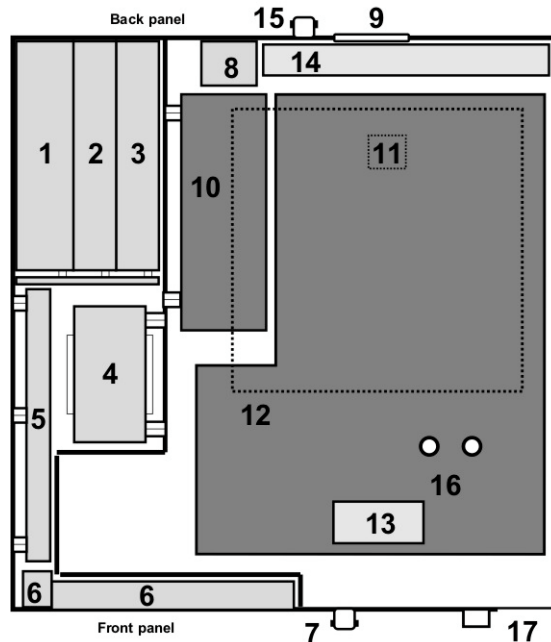
After the release of the preselected number of pulses the polarity is changed. The procedure always starts with positive polarity and changes then to negative. The same parameters as under Quick Start can be selected.



3. Test Equipment TSS 500 M2i B

3.1. Equipment design

The TSS 500M2i B generator is divided into two main parts. The control unit is completely separated and decoupled from the high voltage part.



Control unit

- 1 Power supply board
- 2 Interface board
- 3 Controller board

- 4 Power supply transformer
- 5 Filter board / connecting board
- 6 Keyboard / LCD-Display

High voltage unit

- 7 Measuring and trigger output
- 8 General power supply input, filter
- 10 Ventilation
- 11 High voltage power supply
- 12 Storage cap unit
- 13 High voltage switch, pulse forming and discharge unit

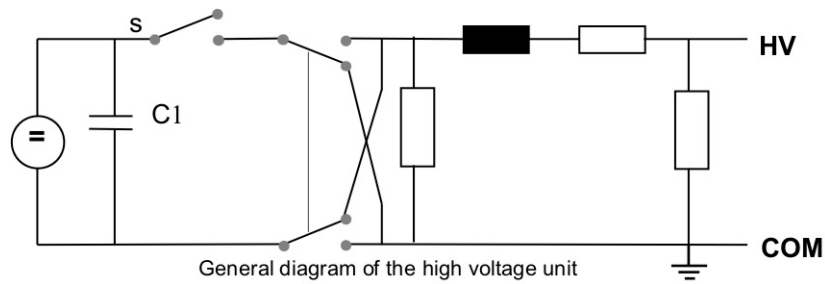
- 14 Current probe
- 15 Rearpanel board
- 16 External Trigger Input
- 17 EUT output adapter box
- 18 EUT output frontside

3.2. Control Unit

The control part includes the processing unit and the driver electronics for the high voltage part. All signals coming from and going to the processing part are decoupled.

3.3. High voltage unit

The high voltage part includes the high voltage power supply and the complete pulse forming part.



The pulse capacitor C1 is charged and will be discharged into the pulse forming network as soon as the specified voltage level is reached.

Discharge switch:

The discharge switch is a highly reproducible semiconductor switch.

Open circuit pulse at low voltage : In some case with low voltage <100V and open circuit condition the holding current of the thyristors can not be reached. In this case the output voltage wavelshape is not correct. Under load condition this phenomena does not appear.

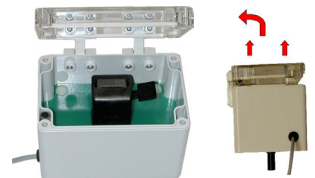
3.4. DUT test box

On top of the generator a DUT test box can be plugged in. The test box is designed to fix different types of SMD varistors into the test circuit.

Part of the test box is a safety circuit switch. In case that the operator may open the test box during a running surge test, the generator will be switched off immediately.

The safety circuit control cable must be plugged in the safety circuit ports at the rear panel of the instrument. IF the DUT testbox is not used, the safety circuit must be closed.

This cable must be plugged in otherwise the generator can not be switched on. For safety the reason we recommend to use this test box for testing any components. In case of components failure an explosion may be a hazard to the operator.



The DUT Testbox is a plastic box who protect the user for exploding devices. The pluggable adapter allows an easy mounting of the test devices. The interlock is switched by the magnetic switch integrated in the cap.

For **open the DUT test box** proceed the following sequence:

1. Lift the cap approx 0.5cm
2. Turn the cap

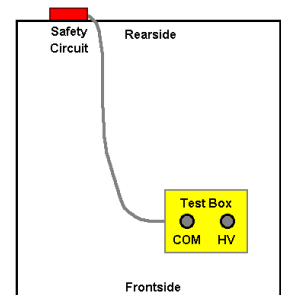
3.5. Test setup

For safety aspects it is important

- not to disconnect the surge simulator form protective earth (power cable)
- to have an installation where the simulator is connected via its ground reference connector to earth

Connections TSS 500 M2i B – Test Box

The figure shows the HV and COM output from the TSS 500 M2i B to the Test Box and the connection of the safety circuit cable.



**Do not touch inside the connector HV and COM
on the top of the TSS 500M2i B generator**

4. Pulse Verification

The output pulse shall be measured directly at the output of the generator.

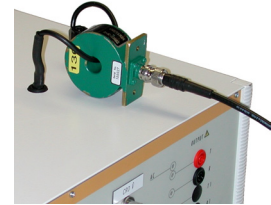
As per Bellcore GR 1089 the generator output has to be verified under short circuit condition.
 - short circuit conditions (peak value \hat{I} and wave shape)

4.1. Verification setup

The output pulses shall be measured directly at the output of the current surge generator. The generator output has to be verified under short circuit conditions.

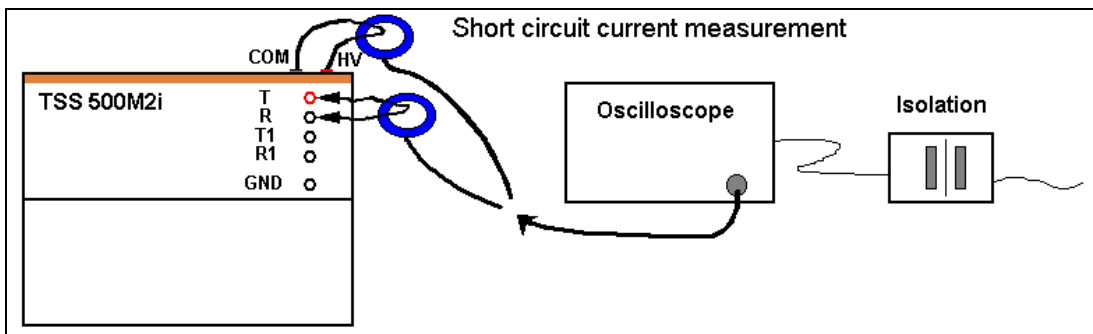
The peak value of \hat{I} and the wave shape must be recorded.

The output connectors HV and COM on the top are in parallel to the plugs T and R on the front panel.



4.1.1. Verification of the Surge pulse short circuit current

- The short circuit current shall be measured directly at the HV – COM on the top cover or T-R output.
- Decouple the oscilloscope by an isolating transformer from the mains
- The current sensor shall have a sufficient bandwidth; at least 1 MHz



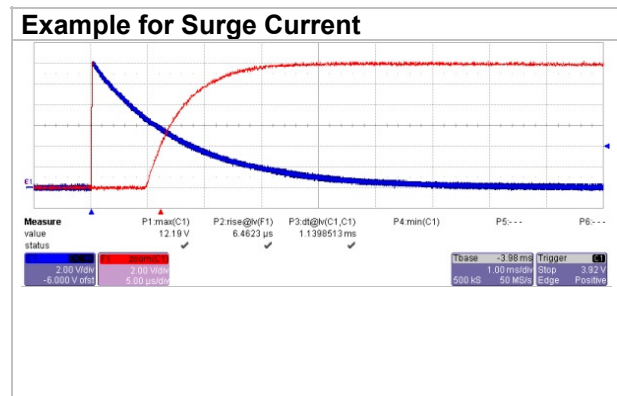
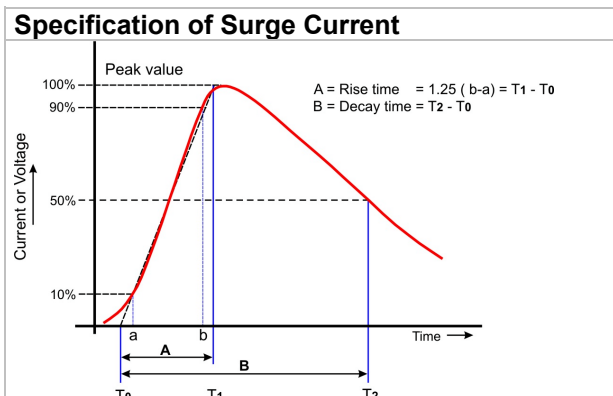
Setup for surge verification

4.2. Specification of the wave shape

The specification is in accordance with Bellcore GR 1089

Surge current pulse 10 / 1000 μ s (short circuit conditions)

Definition	Tolerance acc to the standard	Range
Front Time T1= 1.25 x tr (tr at 10% - 90%)	10.0 μ s +0/-4 μ s	6.0 μ s – 10.0 μ s
Pulse width T2 (10% - 50%)	1000 μ s +500 μ s /-0 μ s	1000 μ s – 1500 μ s
Peak current	-0% +15%	



Use the CRO trigger output of the TSS 500M2i B to trigger the oscilloscope.

5. Technical data

5.1. SURGE Current Requirements as per Bellcore GR 1089

Test level

Charging voltage	50 – 1200V \pm 10%	step 10V
Current Range I	5 – 110A	
Current Range II	10 – 220A	

Short circuit current	Max. 250A
Wave shape	
Front Time T1 (1.25 x tr)	10 μ s -4 μ s / + 0 μ s
Pulse duration T2	1000 μ s +500 μ s / - 0 μ s

Polarity	Pos., Neg., Alt
Repetition rate	3s - 999s
Events preselection	1 - 30'000 or endless
Counter	1 - 1000000

Trigger

Trigger of pulses	AUTO, MAN, EXTERN
Synchronization	0 - 360° (16 - 500Hz)
Resolution	1°

Output

Test box	Mounted on top of the generator
----------	---------------------------------

Measurements

CRO	5V Trigger
CRO \hat{U}	1V / 10V
	Only for measuring residual voltages up to 500V on VDR's
CRO \hat{I}	Range I and Range II 100mV/A
Peak voltmeter	500V or > 500V for higher voltages
Peak current meter	250A

Test Routines

Quick Start	Immediate start, all parameters adjustable during a running test
User Test Routines	User specific test routines (7 stores each) Change voltage level V after n pulses by ΔV Change phase angle A after n pulses by ΔA Change polarity after n pulses



Note: This generator is designed as **current wave generator for component testing**. Therefore the open circuit voltage waveform does not match the Bellcore GR 1089-CORE standard specification.

5.2. General Specifications

Power mains supply 230V/115V, 50/60Hz, less than 75W

Fuse	230V : 2 AT slow blow 115V : 4 AT slow blow
------	--

Safety

Safety circuit External interlock capability
Warning lamp voltage free contact max. 250V 5A
Design per IEC 1010, EN 61010

Interfaces

Serial RS 232 1200 - 19200 Baud
Parallel IEEE Address 1-31

Dimensions

Weight 19" / 6 HU 450 x 515 x 290 mm (W x D x H)
app. 35.2 kg

Environment

Temperature 15° - 35°
Humidity max. 80% non condensing

5.3. Test Box

Dimension 120 x 87 x 87 mm (W x D x H) Height 110 with connector
Internal space for EUT Clip device for SMD components
Safety Interlock with magnetic switch
Weight 0.38kg

=> Not relevant data for the standards can be changed by the manufacturer <=

6. Maintenance and service

6.1. General

The generator is absolutely maintenance-free by using a solid state semiconductor switch to generate transients

6.1.1. Test set- up

When setting up the test national and international regulations regarding human safety have to be guaranteed.

It is recommended to connect the simulator to the ground reference plane of the test set-up.

6.2. Calibration and verification

6.2.1. Factory calibration

Every EM TEST generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The EM Test equipment are calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.

The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label mark any due date for re-calibration.



Example: Calibration mark

6.2.2. Guideline to determine the calibration period of EM Test instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of EM TEST equipment.

EM TEST doesn't know each customer's Quality Assurance Policy nor do we know how often the equipment is used and what kind of tests are performed during the life cycle of a test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follows :

EM TEST make use of a solid state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence thereof a useful calibration period has to be defined based on two criteria :

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation has to be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment has to be taken into consideration.
- Based on the experience and observation collected over the years **EM TEST recommend a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

6.2.3. Calibration of Accessories made by passive components only:

Passive components do not change their technical specification during storage. Consequently the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

6.2.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM Test suggests to refer to the waveshape and values of the original calibration certificate.

7. Delivery Groups

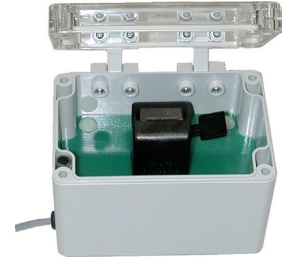
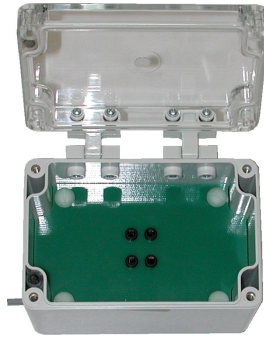
7.1. Basic equipment

- Telecom surge simulator type TSS 500 M2i B
- Mains cable
- Manual
- Calibration certificate

7.2. Accessories and options

Test box for component fixture

- Test box internal test space for EUT
- Integrated safety interlock



8. Appendix

8.1. Declaration of CE-Conformity

Manufacturer : **EM TEST AG**
 Address: Sternenhofstr. 15
 CH 4153 Reinach
 Switzerland

declares, that under its sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name: Telecom Surge Simulator TSS 500
 Model Number(s) TSS 500 M2i B

Low Voltage Directive 73/23/EEC

Standard to which conformity is declared:

EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 89/336/EEC

Standard(s) to which conformity is declared:

EN 61326 Electrical equipment for measurement, control and laboratory use Class A
 EN 61000-3-2 Limits for harmonic current emissions
 EN 61000-3-3 Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

European representative
 EM TEST GmbH
 Lünenerstr. 211
 D 59174 Kamen
 Tel: 00492307-18042
 Fax: 00492307-17050

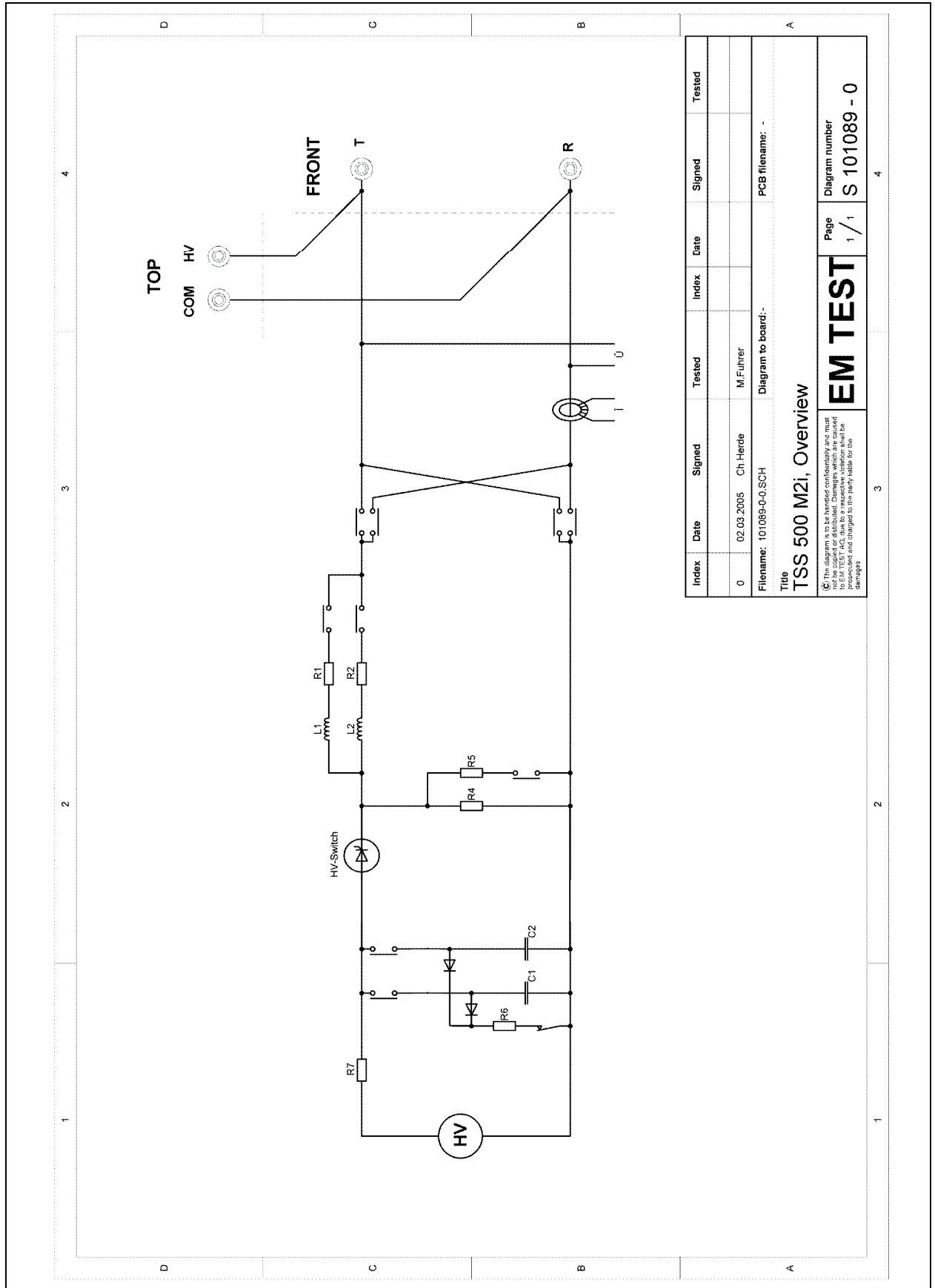
Manufacturer
 EM TEST AG
 Sternenhofstr. 15
 CH 4153 Reinach
 Tel: 004161-7179191
 Fax: 004161-7179199




By U. Flor
 General manager
 Place Kamen, Germany
 Date 2. Mars 2005

H. Kunkel
 Design and Research
 Reinach BL, Switzerland
 2. Mars 2005

8.2. TSS 500 M2i B – Overview

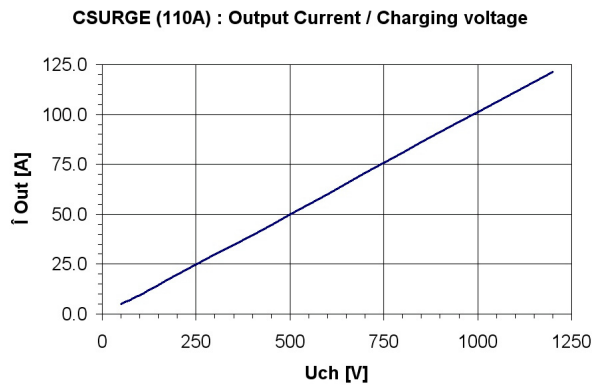


8.3. U/I characteristics

Depends on the selected current range, the generator has the typical U/I output characteristic in the table below. The measurement was made in short circuit condition.

Ucharge	I peak [A] (110A range)	I peak [A] (220A range)
50	5.3	10.7
100	10.1	20.5
200	20.4	41.8
300	30.4	62.1
400	40.5	82.5
500	50.3	103.5
600	60.4	124.8
700	70.9	145.0
800	81.0	167.0
900	90.9	188.0
1000	101.4	209.0
1100	111.9	229.0
1200	121.9	252.0

8.3.1. Diagram 110A range



8.3.2. Diagram 220A range

