



user manual

MP ESD Generator Calibration set



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1 Declaration of Conformity



Manufacturer:

Langer EMV-Technik GmbH

Nöthnitzer Hang 31

01728 Bannewitz

Germany

Langer EMV-Technik GmbH herewith declares that the

MP CI Generator Calibration, including GP 23 Ground Plate

conforms with the following relevant regulations:

- Low-Voltage Directive 2014/35/EU
- Restriction of certain Hazardous Substances 2011/65/EU

The following applicable standards were used to implement the requirements specified by the a forementioned directives:

- DIN EN 61010-1:2020-03 (Safety)
- DIN EN IEC 63000:2019-05 (Restriction of hazardous substances)

Note: This product does not fall within the scope of CE marking requirements, as it has no independent electrical function.

Name of the person authorized to compile the technical

Katja Langer

Bannewitz, 2025-09-08

Signature:

K. Langer, Managing Director

2 General information

2.1 Storage of the user manual

The user manual for the MP ESD Generator Calibration Set enable safe and efficient use. They must be stored near the device and must be accessible to the user at all times.

2.2 Reading and understanding the user manual

Read the user manual carefully and follow the instructions in this manual before operating the device. Pay particular attention to the safety instructions in Chapter 3.

2.3 Local safety and accident prevention regulations

The local accident prevention and safety regulations must be observed for the intended use of the MP ESD Generator Calibration Set.

2.4 Illustrations

The illustrations in this manual are for illustrative purposes only and may differ from the actual design.

2.5 Limitation of liability

Langer EMV-Technik GmbH shall not be liable for damage to property or personal injury if:

- information in this manual has not been observed
- the MP ESD Generator Calibration Set has been operated by personnel who are not qualified in the field of EMC
- unauthorized modifications or technical changes have been made to the MP ESD Generator Calibration Set
- the MP ESD Generator Calibration Set has not been used in accordance with its intended purpose
- non-approved spare parts or accessories have been used

Note on the destruction of oscilloscopes and other measuring instruments:

- The inputs of the oscilloscope or other measuring instruments can be destroyed if the voltages are too high. These excessive voltages can occur if the attenuator is not correctly dimensioned or the voltage of the ESD generator is set too high. In the event of a measuring instrument being destroyed in this way, Langer EMV-Technik GmbH accepts no liability for property damage.
- If the shielding tent is closed for a long period of time, the oscilloscope (or other measuring devices) inside may heat up to an unacceptable level. Langer EMV-Technik GmbH accepts no liability for damage to measuring devices caused by overheating.

The scope of delivery may differ from the illustrations and texts in this operating manual due to individual customer adaptations or technical changes.

2.6 Errors and incompleteness



The information in this manual has been carefully checked and found to be correct. However, Langer EMV-Technik GmbH accepts no liability for typographical errors, printing errors, correction errors, or incompleteness.

2.7 Copyright

The content of this user manual is protected by copyright and may only be used in connection with the MP ESD Generator Calibration Set. This manual may not be used for any other purpose without the prior written consent of Langer EMV-Technik GmbH.

3 Safety

3.1 Symbols and notes


	
General warning symbol	Caution; electricity
Table 1: Safety symbols	

Safety notes are indicated by symbols in this user manual. Observe these notes and act with caution to avoid accidents and damage to persons and property.

3.2 Intended use

The MP ESD Generator Calibration set is used to measure the waveform of the discharge current of an ESD generator. In addition, transient events in the waveform of the discharge current can be measured and visualized in the frequency range up to 3 GHz. The MP ESD Generator Calibration set is built for this specified use and should therefore only be used for this purpose.

3.3 Predictable misuse

	<p>Danger due to misuse!</p> <p>Incorrect use of the MP ESD Generator Calibration Set can lead to dangerous situations!</p>
Attention!	

Incorrect use of the sets includes:

- Use of the product outside the specified specifications.


- Modification or alteration of the product without the consent of Langer EMV-Technik GmbH.
- Operation of the product with a technical defect.

3.4 Personnel requirements

Only personnel trained and experienced in the field of EMC may operate the MP ESD Generator Calibration Set.

Persons whose performance is impaired by alcohol, drugs, or medication may not operate the MP ESD Generator Calibration Set.

3.5 Safety instructions

	<p>Danger from electricity!</p> <p>There is a risk of injury from electric shock! Risk of burns from heat!</p>
<p>Caution: Electricity!</p>	

HF currents can cause irreversible damage to the body, therefore the following safety instructions must be observed.

- All cable connections must be closed.
- If the cable insulation is damaged, the MP ESD Generator Calibration Set must not be used.
- Damaged parts must be replaced with undamaged parts before use. Contact Langer EMV-Technik GmbH to obtain a replacement.
- Protect live parts from moisture to prevent short circuits.
- Never leave a Langer EMV-Technik GmbH product unattended while it is in operation.

Danger from electromagnetic fields!

- The MP ESD Generator Calibration Set itself does not emit any electromagnetic fields. However, when using the MP ESD Generator Calibration Set, the safety precautions of the manufacturer of the ESD generators (or other generators whose parameters are measured with the MP ESD Generator Calibration Set) must be observed at all times.
- With regard to the risk of interference with pacemakers and other cardio-assist devices, the instructions of the manufacturer of the ESD generator or similar must be followed.

4 Scope of delivery

4.1 Scope of delivery MP ESD Generator Calibration set

No.	Designation	Typ	Quantity
1.	Shunt	SM 02-01 SMA	1
2.	Base plate	GP 23	1
3.	Shield cover	BZ 23-1	1
4.	Tent poles	ZG 23-1	1
5.	Ground plane	GND 25	1
6.	Ground adapter	GNDA 02	1
7.	Measuring cable SMA-SMA double shielded	SMA-SMA 1m ds	2
8.	Semi-rigid coaxial cable	SMA-SMA 1m sm	2
9.	SMA-SMA red measuring cable	SMA-SMA rt 0.7 m ds	1
10.	SMA-SMA yellow measuring cable	SMA-SMA ge 0.7 m ds	1
11.	SMA-SMA green measuring cable	SMA-SMA gr 0.7 m ds	1
12.	SMA-SMA blue measuring cable	SMA-SMA bl 0.7 m ds	1
13.	System case	MP ESD calibration case	1
14.	User manual		1

Important: The scope of delivery may vary depending on the respective order.

5 General information

The **MP ESD Generator Calibration set** is used to measure the waveform of the discharge current of an ESD generator.

In addition, transient events in the waveform of the discharge current can be measured and visualized in the frequency range up to 3 GHz. These transient events influence the test result when testing devices. The variations between different types of ESD generators can be attributed to this, among other things.

In order to obtain a reproducible test result, it is recommended to check the waveform of the discharge current generated by the ESD generator and specified by the IEC 61000-4-2 standard.

In addition to the test pulse, ESD generators also emit electrical and magnetic interference fields. These interference fields influence the test object in addition to the test pulse. This additional influence is not defined and distorts the result of the ESD test. In addition to measuring the waveform of the ESD generator with the MP ESD Generator Calibration set, the fields of the ESD generator can be measured with the MP ESD Field set.

6 Measurement setup

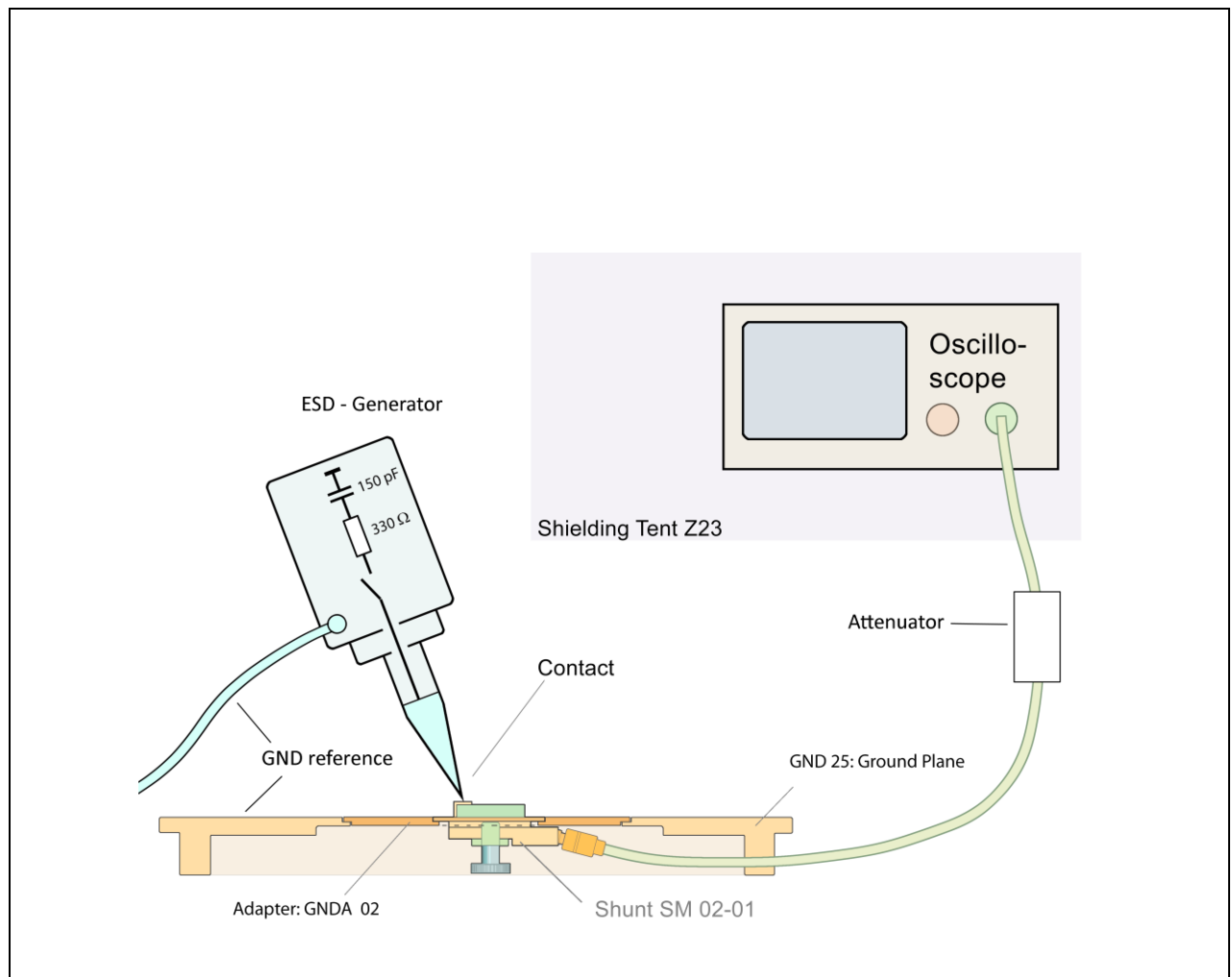


Figure 1 Basic setup of the measuring station

Figure 1 shows the basic setup of the MP ESD Generator Calibration test station. The discharge current of the ESD generator is measured using the SM 02-01 SMA shunt. The shunt is inserted into the GNDA 02 ground adapter and, together with the GND 25, forms the ESD target. The ground reference for the ESD target is provided by the GNDA 02 ground adapter with the GND 25 ground plane.

The output signal from the shunt is fed to the oscilloscope via a measuring cable and an attenuator. The oscilloscope is protected from interference from the ESD generator by the shielding tent.

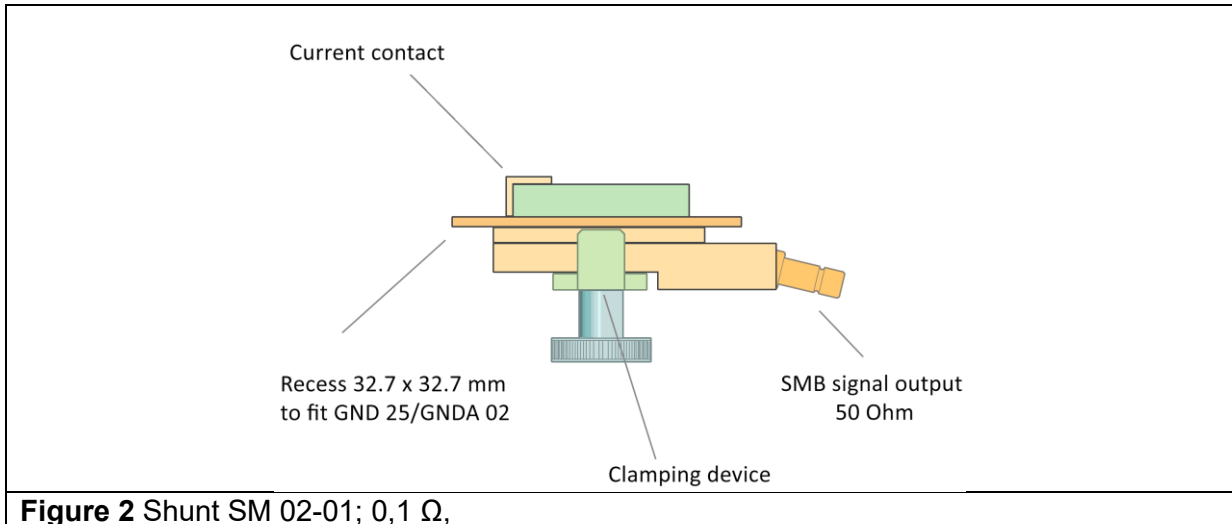


Figure 2 Shunt SM 02-01; 0,1 Ω ,

Figure 2 shows the SM 02-01 shunt. **Figures 3 to 5** show how the shunt is inserted into the GNDA 02 ground adapter.

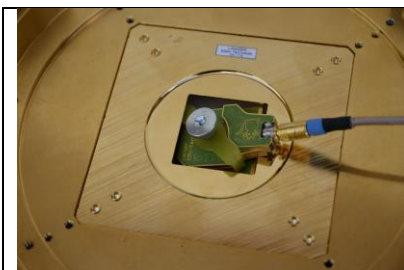


Figure 3 Thread from above



Figure 4 Turn the lock to the right

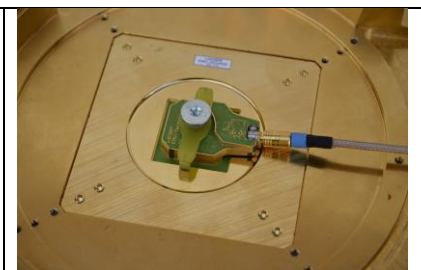


Figure 5 Lightly tighten the knurled screw

The ground adapter is then inserted into the GND 25 ground plane.

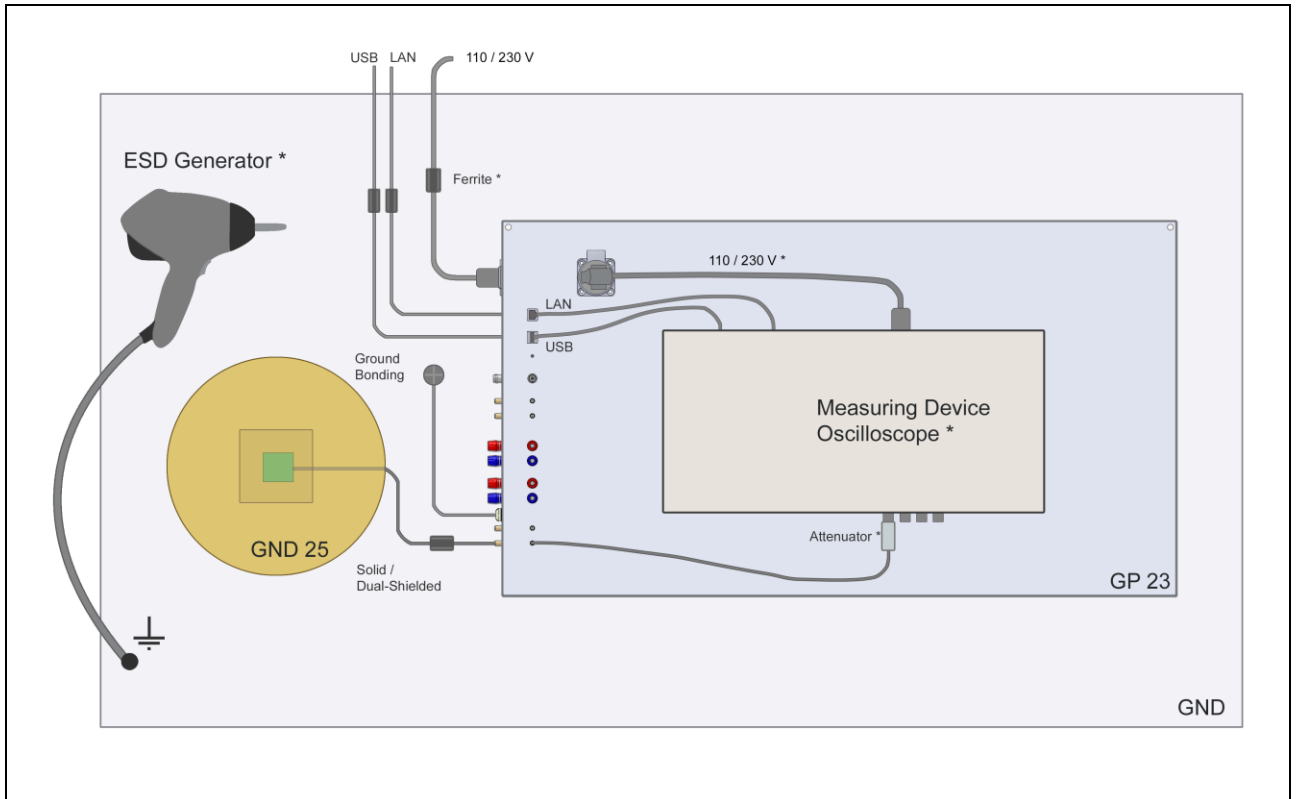


Figure 6 Specific setup of the measuring station

Figure 6 shows the specific setup of the measuring station. A reference ground plane is required for the measurement setup. In **Figure 6**, this could be a metal-covered tabletop, for example. A second GP 23 base plate can also be used (not included in the scope of delivery). The reference ground plane must have screw connection points for the GP23 equipotential bonding conductor and for the ground connection of the ESD generator. The ESD target (shunt SM 02-01, ground adapter GNDA 02, and ground plane GND 25) is placed on the ground reference surface, as shown on the left in **Figure 6**. On the right in **Figure 6**, the shielding tent consisting of base plate GP 23, tent poles, and shielding cover is set up (**Figure 7**). The base plate GP 23 is connected to the ground reference surface via an equipotential bonding conductor. The ESD target is connected to one of the four SMA-SMA RF feed-throughs of the base plate GP 23 via a measuring cable (**Figure 8**). For low test voltages, the double-shielded measuring cable (SMA-SMA 1m ds) is generally sufficient. For high test voltages, it may be necessary to use the solidly shielded semi-rigid coaxial cable (SMA-SMA 1m sm). To reduce interference from cable sheath currents, a hinged ferrite can be attached to the cable (not included in the scope of delivery).



Figure 7 Setting up the canopy tent on the base plate



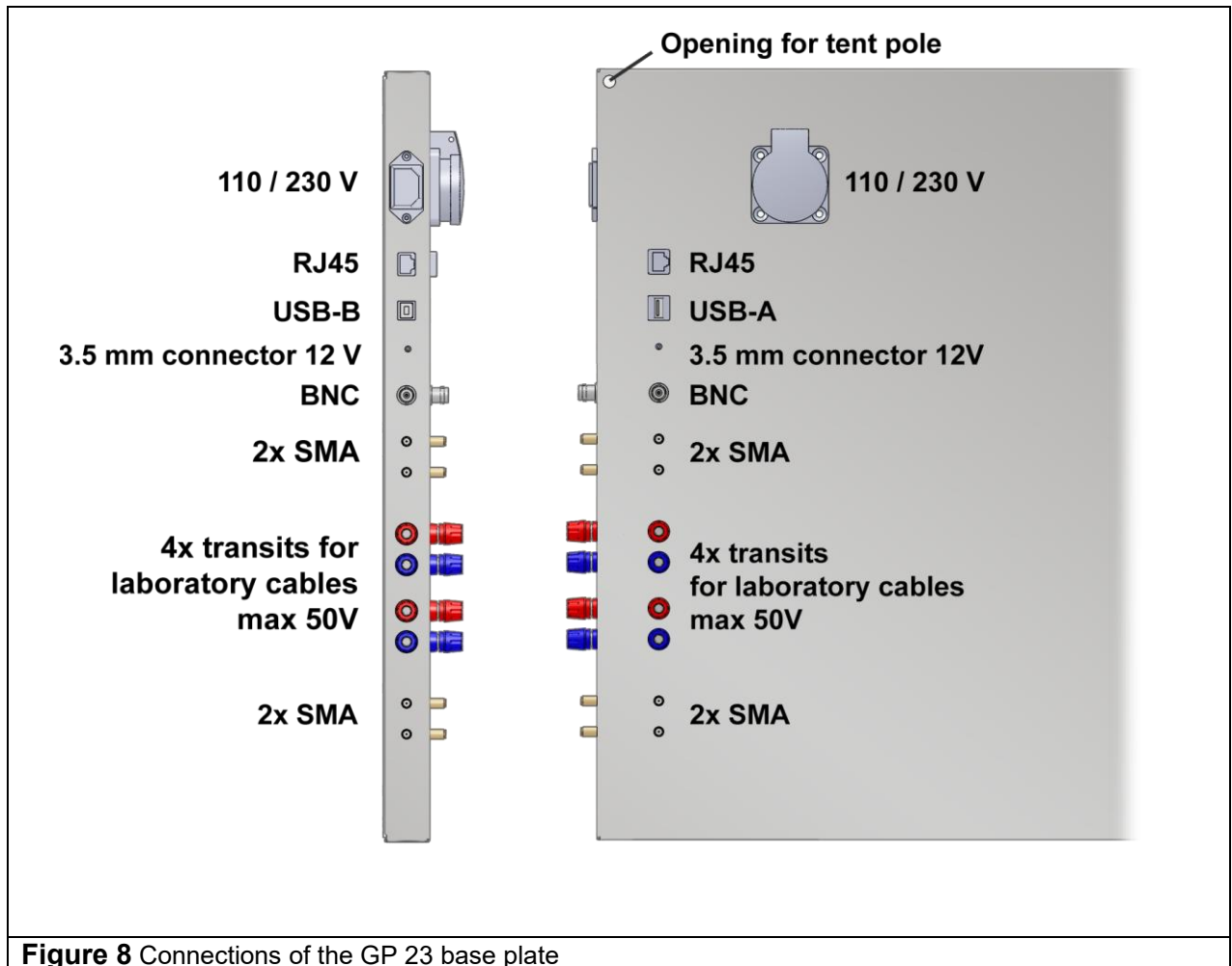


Figure 8 Connections of the GP 23 base plate

The oscilloscope (not included) is placed on the GP 23 base plate (**Figure 6, Figure 10**). It is connected to the mains and, if necessary, to USB or the network via the corresponding feed-throughs on the GP 23 base plate. These connections can also be protected with a hinged ferrite core. The connection of the corresponding oscilloscope input is established with a double-shielded measuring cable (SMA-SMA 0.7 m ds) to the corresponding RF feed-through.

To protect the oscilloscope input, it is recommended to use an attenuator. If necessary, the attenuator should only be used at higher ESD voltages.

Before starting the tests, the ground cable of the ESD generator must be connected to the ground screw of the reference ground plane.

6.1 Quick guide to setup

- The measuring station consists of a reference ground plane (second base plate GP 23, not included in delivery) and a base plate with a shielding tent to hold the oscilloscope.
- The ground plane GND 25 is placed on the reference ground plane using the ground adapter GNDA 02.
- The shunt SM 02-01 SMA (measuring transducer) is inserted into the ground adapter GNDA 02.
- The SMA output of the shunt is connected to an RF feedthrough of the base plate GP 23 via a measuring cable SMA-SMA 1m ds / SMA-SMA 1m sm.
- In the shielded tent (Faraday cage), a connection is established from the output of the RF feedthrough of the GP 23 to the 50 Ohm input of the oscilloscope.
- An attenuator should be connected upstream of the oscilloscope to adjust the measured values.

7 Measurement procedure

The equivalent circuit of the measurement setup is shown in **Figure 9**. The attenuation of the shunt is 26 dB. This attenuation must be added to the value of the downstream attenuator.

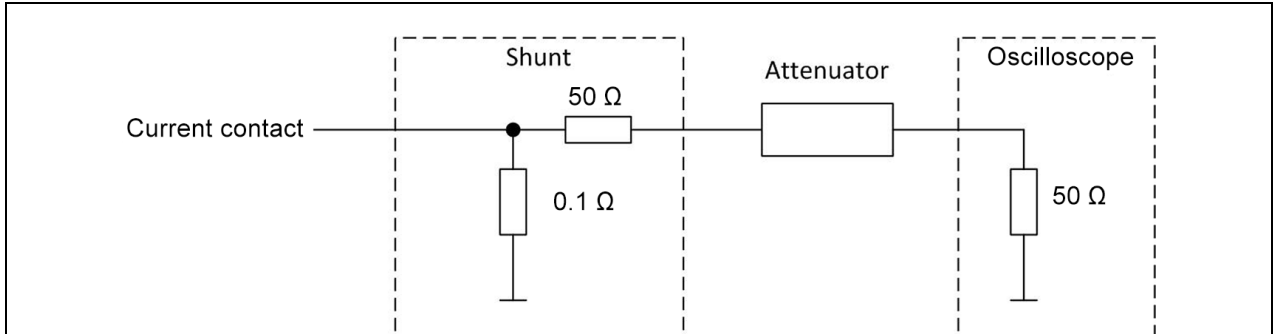


Figure 9 Electrical equivalent circuit of the measurement setup

The conversion from the voltage measured on the oscilloscope to the current through the shunt is based on the correction factor of 26 dB (factor 20).

The current through the shunt can be calculated as follows when measuring voltage on an oscilloscope with a 50-ohm input:

$$I_{Shunt} = \frac{U_{Oszilloskop} \cdot 2}{0,1 \Omega} = 20 \frac{1}{\Omega} \cdot U_{Oszilloskop}$$

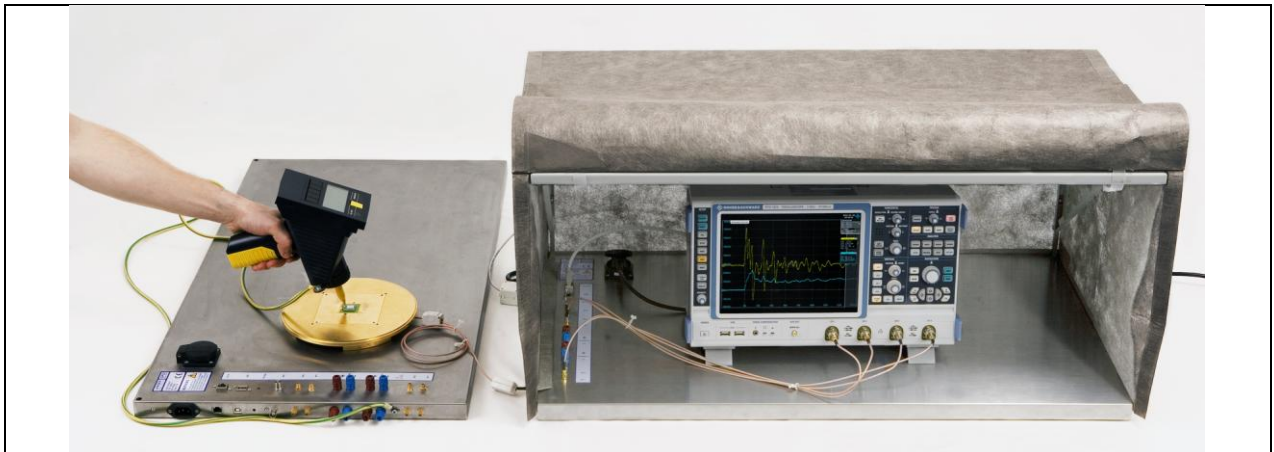


Figure 10 Inserting the tip into the hole of the power contact

Testing the shielding of the measurement setup

Instead of the shunt, an SMA 50 Ohm terminating resistor is screwed onto the measuring cable. The ESD generator is used to couple discharges to the reference ground plate. Start with 0.5 kV. Check whether the oscilloscope records an interference signal. If the oscilloscope is triggered by the ESD generator, interference is penetrating the shielding. Check whether all screw connections on the measuring cables are tight and whether the tent cover fits tightly against the GP 23 base plate. Any double-shielded cables used outside the shielding tent may need to be replaced with solidly shielded semi-rigid coaxial cables (SMA-SMA 1m sm). The shielding test is repeated step by step with double the voltage each time up to the highest planned interference voltage. If necessary, this test can be repeated with the shielded tent open (**Figure 10**). When the shielded tent is closed, care must be taken to ensure that the oscilloscope does not overheat.

Recording the disturbance

The oscilloscope must be set up according to the measurement project. The oscilloscope can be controlled remotely via LAN or USB.

The tip of the ESD generator is placed on the current contact of the SM 02-01 shunt. Make sure that the tip is seated in the hole provided. This prevents the tip of the ESD generator from damaging the shunt. The discharge process is triggered on the ESD generator. The oscilloscope records the interference process. It may be necessary to improve the settings of the oscilloscope or adjust the value of the attenuator.

Figure 11 shows the discharge current curves of two ESD generators. **Figure 12** shows the current curve of the first discharge current peak.

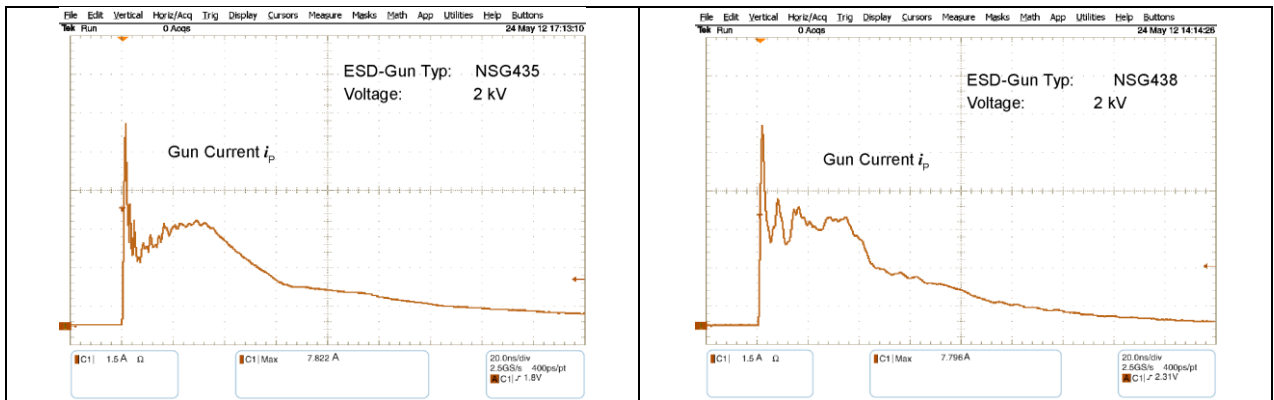


Figure 11 Discharge current curve of two different ESD generators

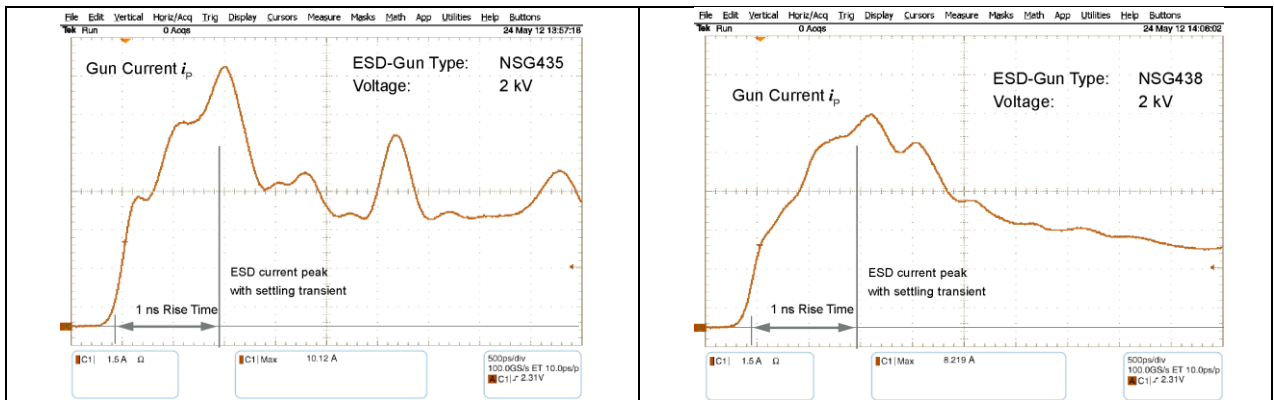


Figure 12 First discharge current peak from two different ESD generators

The measurements serve two purposes:

1. Investigation of the interference effectiveness of the discharge current from ESD generators depending on the generator type and manual guidance of the generator.
2. Compliance with the waveform parameters for ESD generators according to IEC 61000-4-2.

8 Technical parameters

8.1 Shunt SM 02-01

frequency range	DC ... 3 GHz
input resistance	0,1 Ω
output resistance	50 Ω
measurement output	50 Ω , SMA
correction factor	26 dB
single pulse withstand capability	150 A

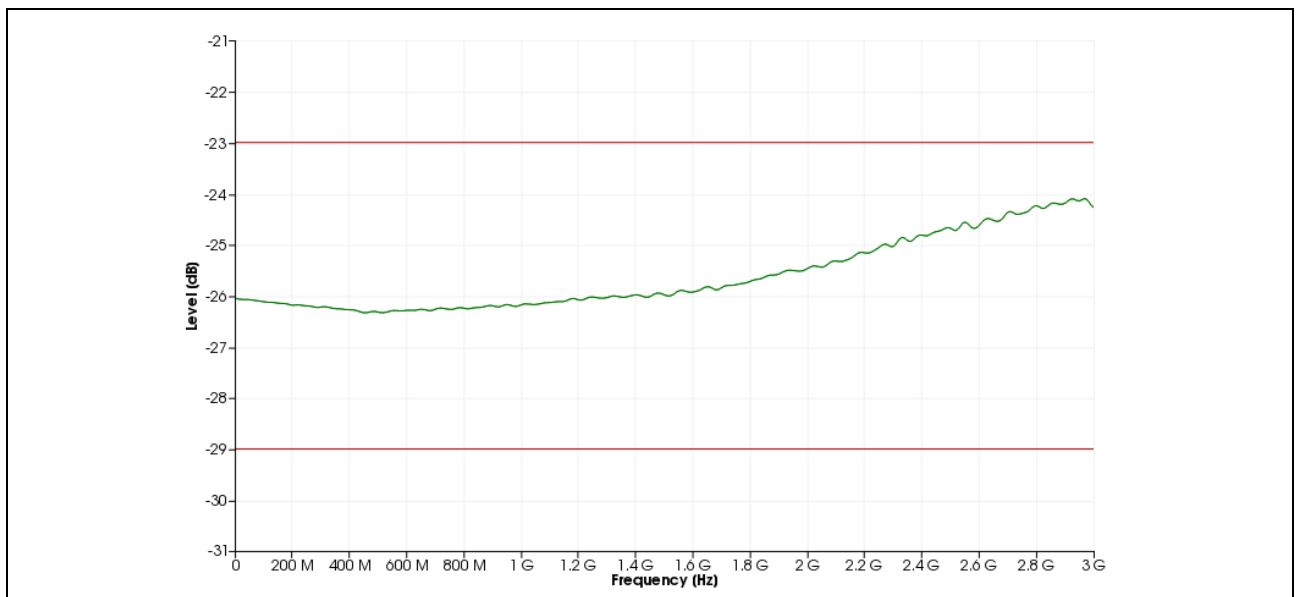


Figure 13: Frequency response Shunt SM 02-01 (green transfer function, red ± 3 dB)

8.2 Base plate GP 23

	Max. continuous current	damping
net	10 A	50 dB bei 1 MHz – 1 GHz
DC socket 12V	2,5 A	40 dB bei 1 MHz – 1 GHz
Pol terminal	10 A	50 dB bei 1 MHz – 1 GHz
work surface	(900 x 500) mm	

8.3 Shielding tent BZ 23

	Workspace (length x width x height)	damping
BZ 23-1	(900 x 500 x 400) mm	45 – 50 dB bei 30 MHz – 1 GHz
BZ 23-2 (optional)	(900 x 500 x 650) mm	45 – 50 dB bei 30 MHz – 1 GHz

9 Information on Recycling and Disposal



DE 80567526

In accordance with the WEEE Directive 2012/19/EU (Waste of Electrical and Electronic Equipment), the following must be observed:

At the end of its service life, this product should be taken to a suitable disposal facility for recycling and disposal. Do not dispose of with household waste.

10 Customer service

Please contact us if you have any questions, comments or suggestions.

You can contact us:

Monday – Friday

8:00 Uhr bis 15 Uhr (CET)

Contact us at:

Address: Langer EMV-Technik GmbH

Nöthnitzer Hang 31

01728 Bannewitz

Germany

Internet: <https://www.langer-emv.com/>

E-mail: sales@langer-emv.de

Phone: +49 (0) 351-430093-0

Fax: +49 (0) 351-430093-22

Calibration

We recommend having the product calibrated every two years by the manufacturer Langer EMV-Technik GmbH or by a certified distributor.

11 Warranty

Langer EMV-Technik GmbH shall remedy all defects attributable to material or manufacturing faults within the statutory warranty period by repairing the product or supplying replacement parts.

This guarantee is only granted on condition that:

- the information and instructions in the operating instructions are observed.

The guarantee expires if:

- an unauthorized repair is carried out on the product
- the product is modified
- the product is not used as intended