



MINI E-Field generator P23

Operating instructions



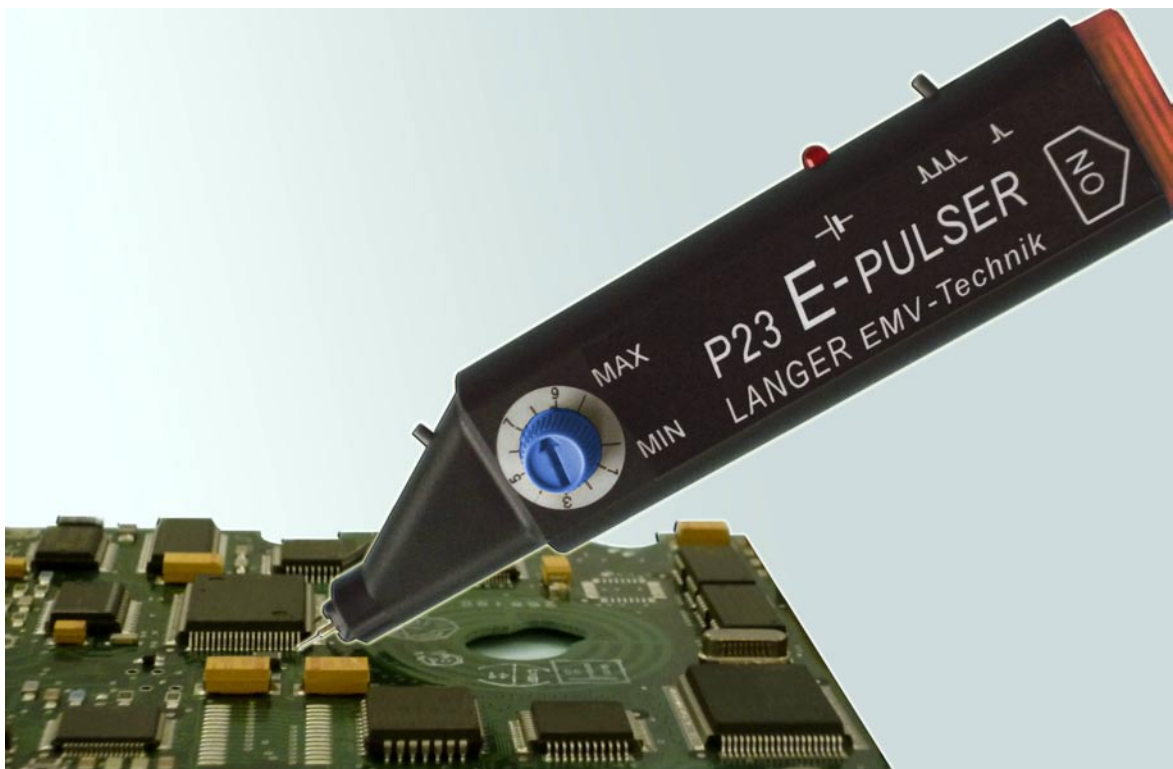
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1. Disturbance mechanisms

- > Electronic modules have a different disturbance immunity depending on their layout and IC sensitivity.
- > Their susceptibility to burst and ESD results from weak spots that can be exactly pinpointed. The development of these weak spots depends largely on the layout geometry and type / manufacturer of the installed IC.
- > Disturbances have to be applied to selected individual lines (e.g. in bus systems) and/or their vias or individual IC pins to locate susceptible components of the module more precisely.
- > This requires a high mechanical resolution of the disturbance source.



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2. Use

The MINI E-field generator is used to examine PCBs in the course of their development.

The field source of the generator produces voltage pulses that are similar to ESD. These can be injected into the device under test very precisely with an exchangeable needle electrode. This electrode is connected to the disturbance generator via an internal fixed capacity of 10 pF.

The MINI E-field generator is placed on the device under test by hand. The needle electrode thereby makes a metallic connection.

This allows the developer to precisely influence selected and very fine GND/Vcc structures, individual vias or IC pins on PCBs and to determine the presence of weak spots via functional faults.

Since the disturbance intensity is adjustable, weak spots can be compared with each other and the effectiveness of EMC measures can be evaluated.

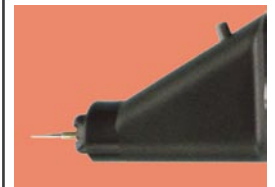
The high mechanical resolution allows specific examinations of even densely packaged structures (e.g.: bottom of BGA) and a comparative assessment of the pins' susceptibility.

P23 E-pulser

Weak spot tester r

ORANGE

Produce a very precisely electrical field (Tip) for the localization of E-field-sensitive IC-pins and tracks

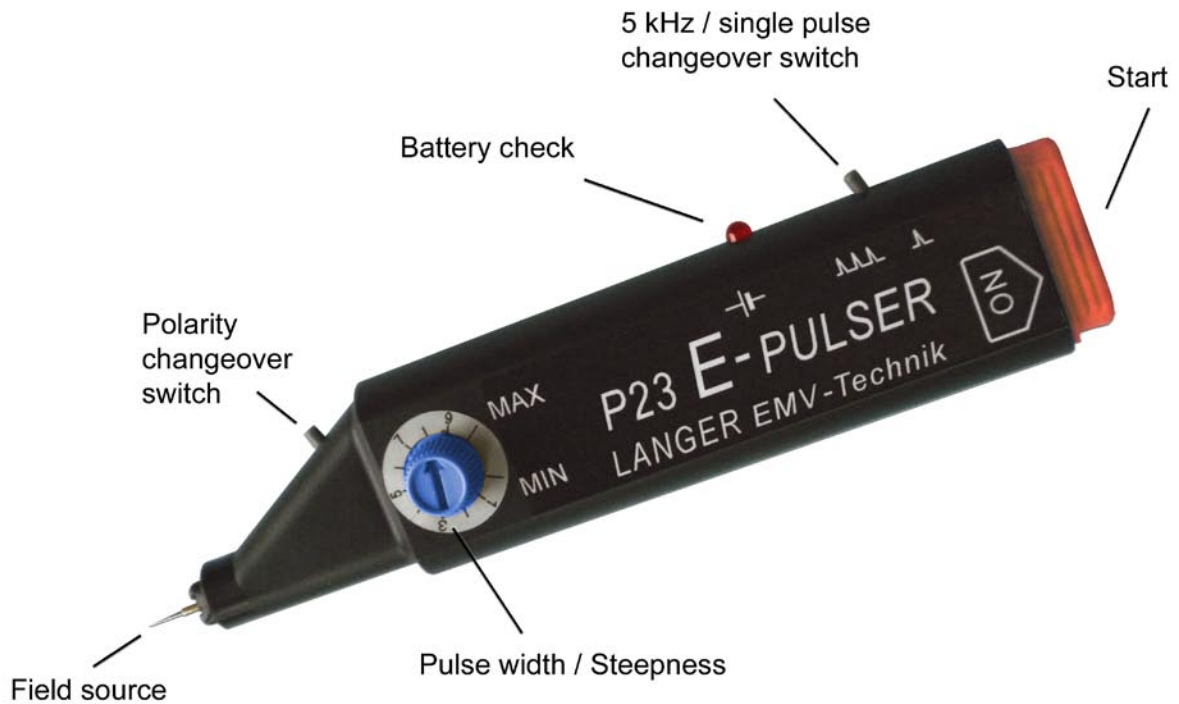


The MINI E-field generator cannot be used for compliance testing. Measurements on standard test stations are necessary to determine standard disturbance immunity values. Practical experience, however, allows assessments.

Random comparative measurements should be carried out with standard disturbances to achieve the disturbance immunity level that is defined by the standard in tests in the course of development.

3. Design

- > The MINI E-field generator comprises a battery-powered disturbance generator which is connected to the needle electrode via an internal 10 pF fixed capacity.
- > When the generator is switched on, either a single pulse or a continuous pulse sequence is output depending on its setting.



4. Operation

ON pushbutton:	The device is only active with the button pressed (no closed-circuit current)
Single pulse:	A pulse is triggered each time the ON pushbutton is pressed.
Pulse sequence:	Pulses are produced at a repetition frequency of approx. 5 kHz as long as the ON pushbutton is pressed.
Intensity:	Max: steep edge – high steepness Min: steep edge – reduced steepness
Polarity:	The polarity of the disturbance can be switched over.
LED:	„Voltage monitoring“ The battery has to be changed if the LED comes on permanently.

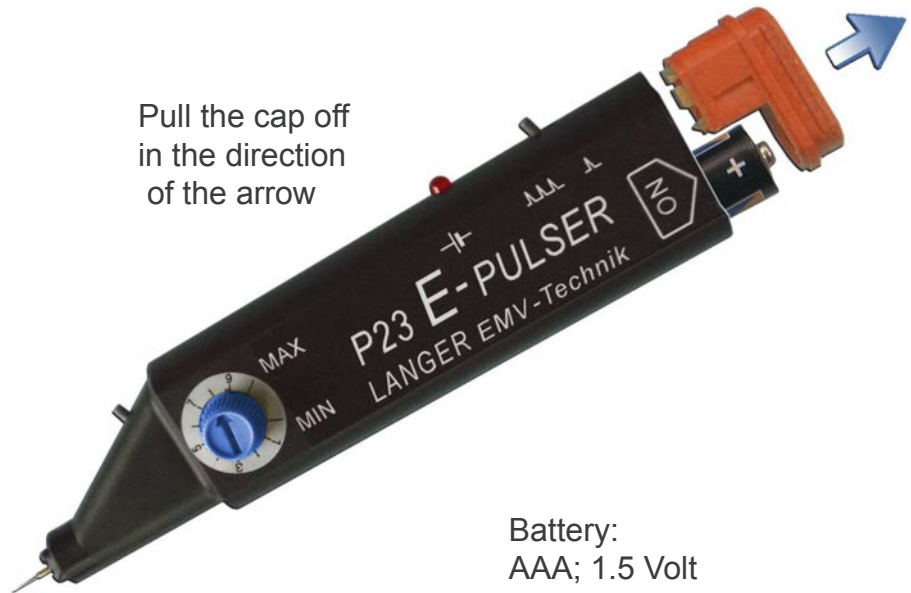
Note: The tips of the MINI E-field generator are sensitive to mechanical stress.

5. Battery change

By removing the rear cap:

Pull the cap off
in the direction
of the arrow

- Plus pole (+) of battery on the cap side
- Replace the cap in the reverse order

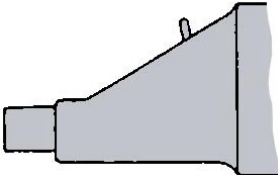
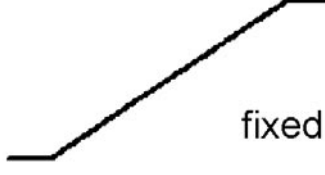
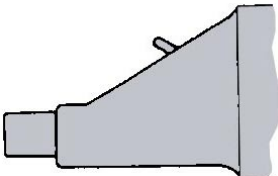
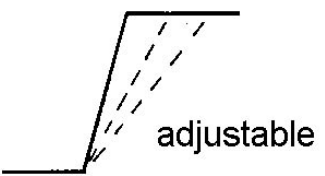
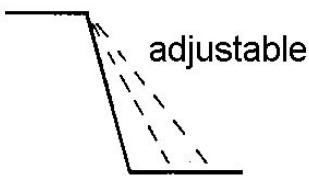


Battery:
AAA; 1.5 Volt

6. Setting the pulse parameters

POLARITY: The direction of the steep edge can be switched over on the „Polarity“ switch.

INTENSITY: The pulse width / height can be adjusted with the „Intensity“ controller.

Pulse parameter:	Change of the electric field strength	
Polarity	Positive edge	Negative edge
Switch position	FLAT constant: approx. 1.2 kV/mm μ s	
	 fixed	
Switch position	STEEP MAX setting: approx. 1.2 kV/mm ns	STEEP MAX setting: approx. 1.2 kV/mm ns
	 adjustable	 adjustable
Repetition frequency	5 kHz	

Use	
STEEP 1.2 kV/mm ns	- only fast IC (digital technology) - high-resistance and low-resistance structures
FLAT 1.2 kV/mm μ s	- slow and fast IC - high-resistance structures

The STEEP edge can be adjusted with the „Intensity“ controller. The maximum value of the field strength change $E=1.2 \text{ kV/mm ns}$ corresponds to the MAX setting and can be reduced with the controller. This allows the evaluation of the susceptibility of weak spots and / or the sensitivity of the IC concerned. The scale is divided into ten parts for a better orientation.

7. Tests

7.1 Start-up

Single pulses / pulse sequences are triggered by pressing the ON pushbutton (please refer to Point 4 for operation and Point 6 for setting the pulse parameters).

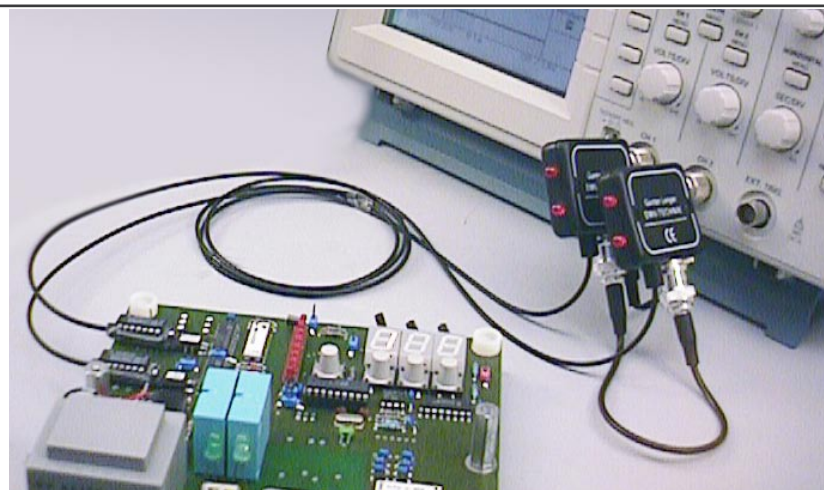
Functional check using the „Voltage monitoring“ LED

- Flashes briefly if the ON pushbutton is pressed – system is operational
- Steady light: battery is empty.

7.2 Preparation

ATTENTION! Make sure that internal functional faults are visible from outside. The device under test may be destroyed by an increase in pulse intensity if the faults are not visible outside. Take the following measures as necessary:

- Monitoring of representative signals with EMC sensors (connect EMC sensor to counter via optical fibre)
- Special test software
- Visible reaction of the device under test to inputs



7.3 Search for weak spots

Procedure:

- Set the minimum intensity (MIN), pulse sequence 5 kHz.
- Place the tip on the spot to be tested of the device under test.
- Establish a metal connection. If necessary, penetrate the solder resist with the tip. (Apply the tip vertically if possible to prevent damage to the needle electrode.)
- Switch the polarity over and repeat the process.
- Increase the intensity gradually.
- Search different spots until functional faults occur.

Susceptibility of the module:

- The denser the GND system is in an area of the module the less susceptible this area is.
- Large surface areas normally react to pulse disturbances if the module has a weak GND system.
- Weak spots are mostly concentrated in small areas of modules which have a strong GND system.
- High-resistance signal line structures (quartzes, pull-up's) are especially susceptible to E-field.

Single pulse:

- These pulses are used to determine edge-sensitive signal lines and components. One pulse is normally enough to trigger a functional fault.
- Example: RESET lines and components

8. Safety and warranty

When using the LANGER EMV-Technik product please observe the following basic safety instructions to protect yourself against electric shock and the risk of injury.

8.1 Safety instructions

- Read and comply with the operating manual and keep the it in a safe place for subsequent use.
- Always perform a visual check of the LANGER EMV-Technik product before use. Damaged or defected pulsers should not be used.
- When in use, MINI E-field generators create functional electrical or magnetic pulse fields in the surrounding area.
Only personnel who are qualified in the field of EMC and fit for working under the influence of disturbance voltages and magnetic as well as electric fields may use the device.
- The LANGER EMV-Technik product is **only** in use in applications it has been designed for. Any other use is not permitted.
- Do not leave the LANGER EMV-Technik product unsupervised.
- Due to their function, the pulse fields, which are injected into the modules, can lead to destruction, if the level of radiation is too high (latch-up).
Protection: - gradual increase of the disturbance quantity, abort in case of a function failure
 - interruption of the power supply of the unit under test (UUT) in case of a latch-up
- **Attention!**
When the MINI E-field generator is utilized in living quarters, business areas, commercial areas, or small factories, abnormally high disturbance transmissions may occur.
It is the task of the user, to take measures to ensure that the proper operation of all products, which are installed separately from the in-house EMC-environment, are not impaired (especially by means of disturbance transmissions).
This can be achieved by: - observance of the necessary safety distance
 - Use of screened rooms or rooms providing screening
- **Attention!**
No liability is assumed for the destruction of any UUT's!

8.2 Warranty

We will remedy any defect which is due to defective materials or defective manufacture, either by replacement, repair or supply of spare parts, during the legal warranty period. The warranty period is subject to the applicable law of the country where the LANGER EMV-Technik product was purchased.

Warranty is only granted on condition that:

- the LANGER EMV-Technik product is handled with care and properly maintained.
- the operating instructions are observed.
- only original spare parts are used.
- external components such as power supply units, connecting cable, etc. have separate warranty terms and conditions which apply for the respective manufacturer.

The warranty is forfeited if:

- unauthorized repairs have been made on the LANGER EMV-Technik product.
- the LANGER EMV-Technik product has been modified.
- the LANGER EMV-Technik product has not been used correctly.

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9. Technical data

Dimensions (width/height/depth)	118 x 24 x 13 (mm)
Weight (incl. battery)	30 g
Pulse parameters	see Point 6
Pulse sequence	Single pulse / 5 kHz, can be switched over
Generator voltage	1,2 kV
Internal coupling capacity	10 pF
Polarity	can be switched over
Supply voltage - battery	AAA; 1.5 Volt

Standards used as a basis for CE mark test

Emission: EN 50 081-1 / -2
Immunity: EN 50 082-1 / -2

10. Scope of delivery

MINI E-Feldgenerator P23

Item.	Designation	Type	Quantity
01	E-pulser / orange	P23	1
02	Case		1
03	Quick guide		1
04	Operating instructions		1

