



User manual

Mini-burst field generators **P11t** and **P12t**



With external trigger

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1 Description

The **P11t** and **P12t** mini-burst field generators are tools which are used to carry out immunity analyses in the development stage. They generate fast transient magnetic fields at their tip. These fields can be injected into the device under test (module, component) with pinpoint accuracy. The mini-burst field generators can be used to expose selected components or parts of the layout to magnetic fields while the module is in operation. The mini-burst field generators have a TTL trigger input. Signals from the device under test or external control logic can be used to synchronize the mini-burst field generators. Accurate immunity analyses can thus be carried out on complex circuits during certain operating states. **Figure 1** shows the schematic set-up and the disturbance coupling mechanism.

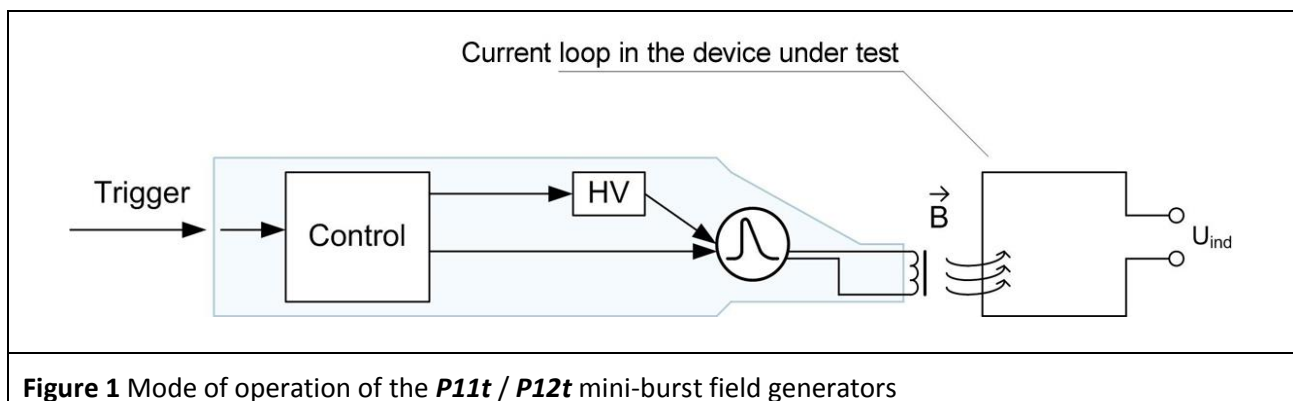


Figure 1 Mode of operation of the **P11t** / **P12t** mini-burst field generators

A mini-burst field generator comprises the control logic, a high-voltage generator (HV) and a pulse shaper circuit. A plug-in power supply unit (included in the scope of delivery) provides the required power. Please observe the permissible maximum values (**Table 1**) if a laboratory power supply unit is used.

The mini-burst field generators are ideal to carry out immunity analyses on modules in the development stage and determine weak points very quickly.

1.1 Design of a mini-burst field generator

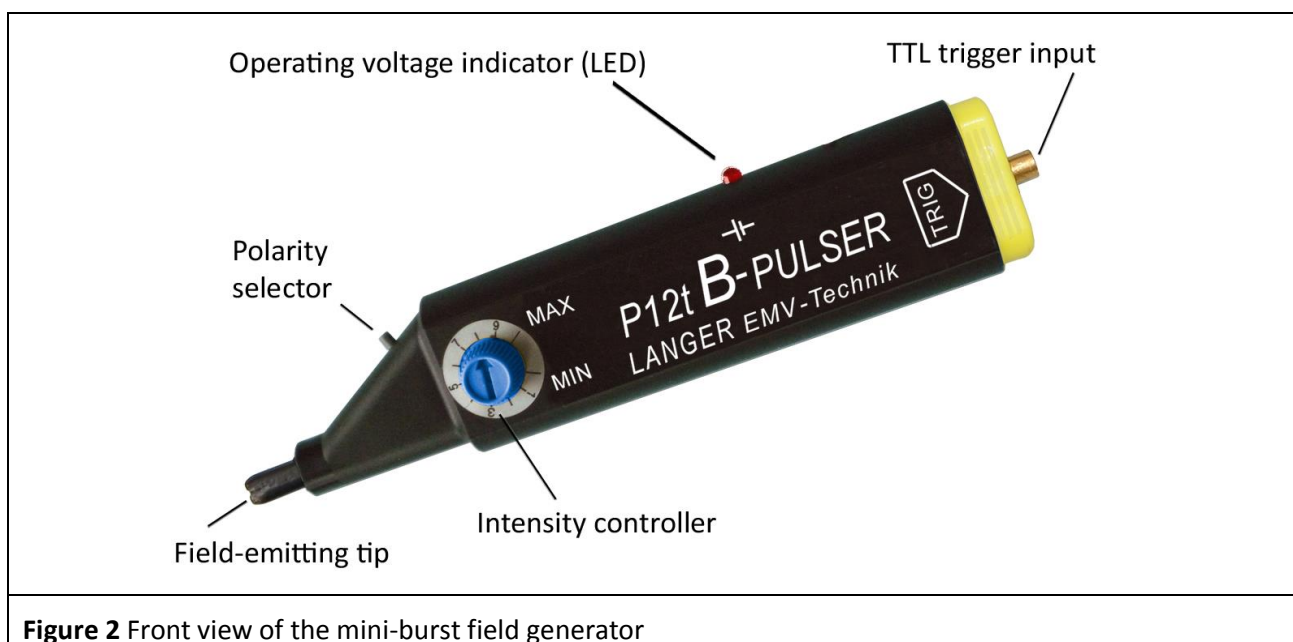


Figure 2 Front view of the mini-burst field generator

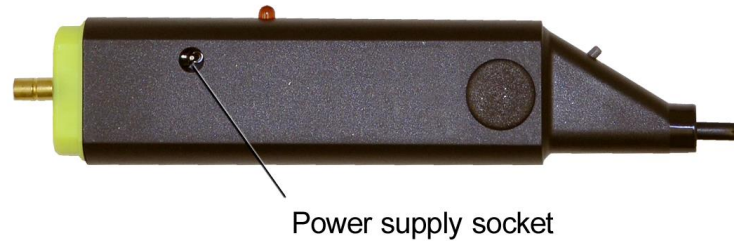


Figure 3 Rear view of the mini-burst field generator

TTL trigger input	SMB male jack Input to trigger a disturbance pulse
Operating voltage indicator LED	- comes on briefly when the power supply is connected - comes on permanently: the power supply is too low
Polarity selector	Changes the current direction in the mini-burst field generator and thus rotates the magnetic field by 180°.
Intensity controller	Infinitely variable rotary controller to adjust the intensity of the disturbance field (amplitude / rise). The interference that is achieved also depends on the geometry of the structures under test.
Power supply socket	3 mm supply voltage jack to connect the 3 mm plug of the power supply unit.

1.2 Function of the mini-burst field generator

Power is supplied to the mini-burst field generator. A rising switching edge is applied to the TTL trigger input which generates a steep current pulse in the pulse shaper circuit. This pulse is led to the tip of the mini-burst field generator via a coil. The magnetic field which is generated by the coil can be injected into different conductor loops such as component contacts, bus system lines and plug contacts (**P11t**) or individual IC pins (**P12t**).

The interference that is achieved depends on the following parameters:

- intensity set at the mini-burst field generator
- pulse repetition frequency
- geometry of the device under test (e.g. size of the conductor loops)

1.3 Pulse shape

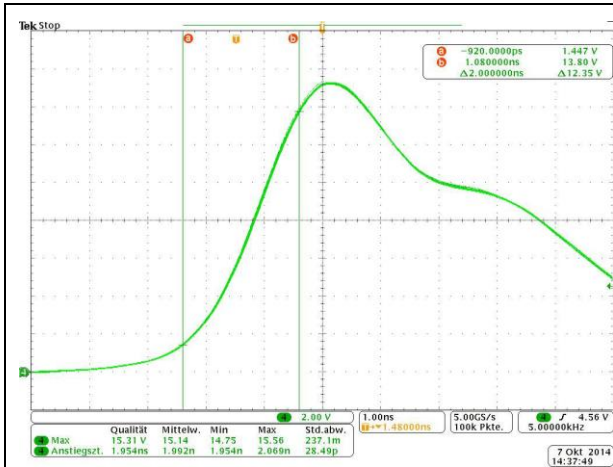


Figure 4 Pulse shape – maximum intensity

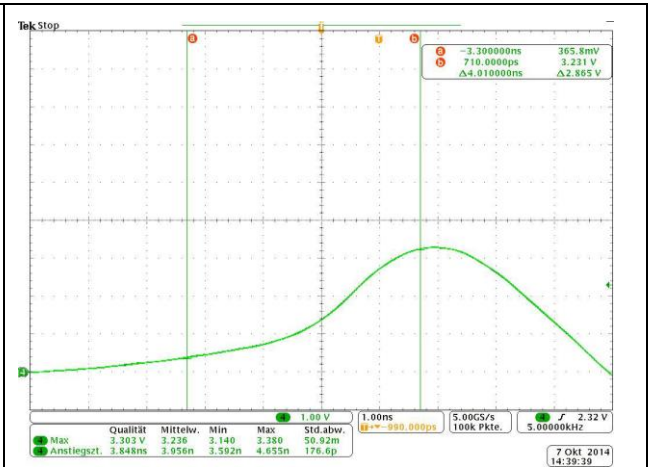


Figure 5 Pulse shape – minimum intensity

2 Start-up

1. Ensure that none of the devices are damaged in any way.
2. Connect the enclosed power supply unit to the mini-burst field generator. The operating voltage indicator LED comes on briefly.
3. Set the Intensity controller on the side of the mini-burst field generator to Minimum. The device under test may be destroyed if the interference is too great. The intensity should thus be gradually increased during the immunity analysis, starting at minimum.
4. Connect the TTL trigger input of the mini-burst field generator to a signal source.
 - a. Function generator, test logic: the permissible frequency and voltage values are listed in **Table 1** and **Table 2**.
 - b. Trigger signal from the device under test: the permissible frequency and voltage values are listed in **Table 1** and **Table 2**.
5. Guide the tip of the mini-burst field generator across the device under test. Pay attention to the distance between the tip and the device under test. The greatest interference is achieved if the mini-burst field generator is placed directly onto the device under test. The interference decreases the further the tip of the generator is moved away from the device under test.
6. Gradually increase the interference at the Intensity controller if no faults occur in the device under test. Guide the tip of the mini-burst field generator across the device under test again.

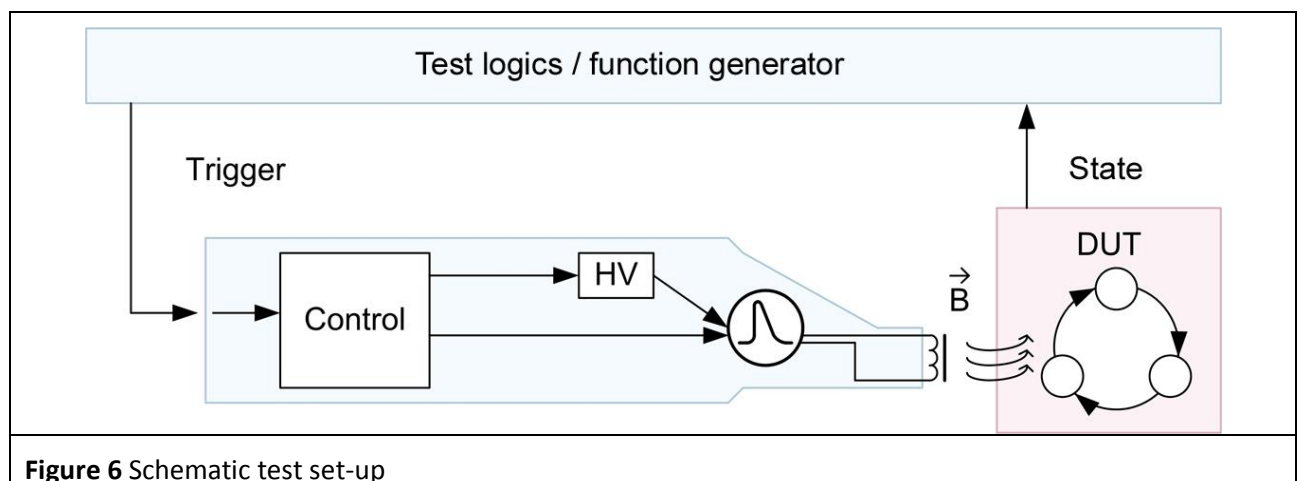
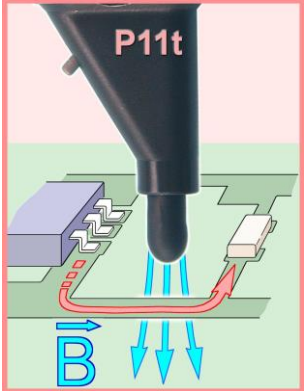

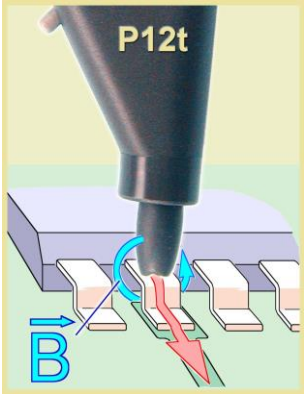



Figure 6 Schematic test set-up

2.1 Mode of operation of the P11t and P12t mini-burst field generators

Type	Use	Tip
 <p>The diagram shows the P11t probe tip positioned above a printed circuit board (PCB). Blue arrows indicate a magnetic field \vec{B} emerging from the tip and passing through the board. A red line on the board represents a conductor run.</p>	<p>A magnetic disturbance field with a diameter of approx. 3 mm emerges from the P11t mini-burst field generator. This magnetic disturbance field can be synchronized with the signals from the device under test or external signal generators via the TTL trigger input. This enables an accurate immunity analysis of complex electronic circuits during certain operating states. The P11t can thus localize sensitive conductor run sections, components and component connections.</p>	
 <p>The diagram shows the P12t probe tip in contact with a component on a PCB. Blue arrows indicate a magnetic field \vec{B} being applied to the component. A red arrow shows a disturbance current being injected into the component.</p>	<p>The P12t mini-burst field generator generates a magnetic disturbance field according to the principle of a coupling clamp. A disturbance current can thus be injected into individual conductor runs, IC pins, SMD components and thin lines (ribbon cable). The P12t's magnetic disturbance field can be synchronized with the signals from the device under test or external signal generators via the TTL trigger input. This enables an accurate immunity analysis of complex electronic circuits during certain operating states.</p>	

3 Application example

Figure 7 shows an example of how the **P12t** mini-burst field generator can be used.

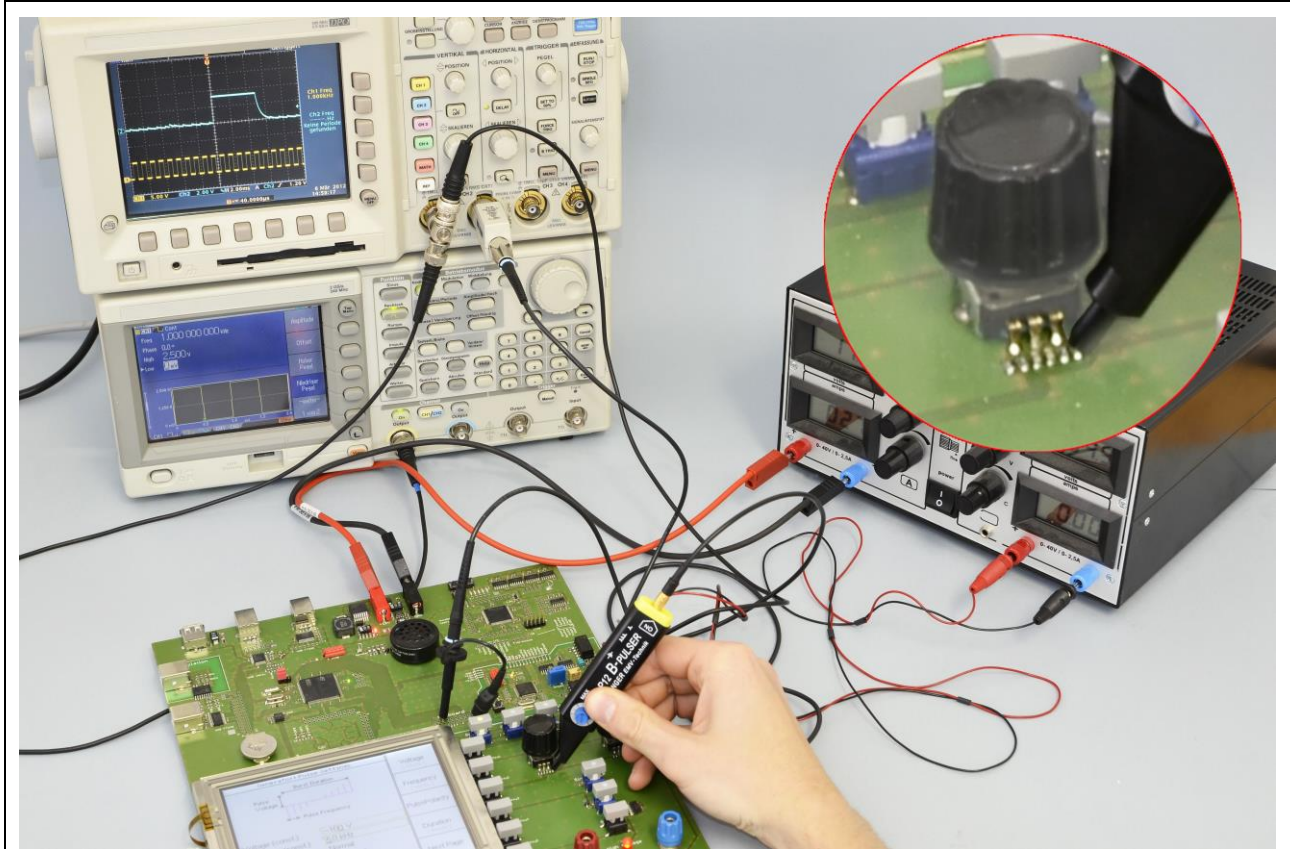


Figure 7 Application example

The input of a rotary encoder is being tested here. The mini-burst field generator receives its trigger signal from a function generator. The oscilloscope is used to monitor the device under test.

4 Safety instructions

This product meets the requirements of the following directives of the European Union: 2004/108/EC (EMC directive) and 2006/95/EC (low-voltage directive).

Please observe the following safety instructions when using a product from LANGER EMV Technik GmbH to protect yourself against the risk of electric shocks or injuries.

Read and follow the instructions in the user manual and keep this in a safe place for later reference. The device may only be used by personnel who are qualified in the field of EMC and who are fit to work under the influence of disturbance voltages and (electric and magnetic) burst fields.

- Never use any damaged or defective devices.

Carry out a visual check before using a measurement set-up with a device from Langer EMV-Technik GmbH. Replace any damaged connecting cables before starting the product.

- Never leave a product from Langer EMV-Technik GmbH unattended whilst this is in operation.
- The Langer EMV-Technik GmbH device may only be used for its intended purpose. Any other use is forbidden.
- Observe and follow the user manuals and safety instructions relating to all of the devices which are used together with the device from Langer EMV-Technik GmbH.
- People with a pace-maker are not allowed to work with this device.
- The test set-up should always be operated via a filtered power supply.
- **Attention! Functional near fields and interference emissions may occur when operating the mini-burst field generators and especially when using the test set-ups described in this manual. The user is responsible for taking measures to prevent any interference to the correct function of products outside the operational EMC environment (in particular through interference emissions).**

This can be achieved by:

- observing an appropriate safety distance,
- use of shielded or shielding rooms.
- The disturbances that are injected into the modules can destroy the device under test (latch-up) if their intensity is too high. Protect the device under test by:
 - increasing the disturbance gradually and stopping when a functional fault occurs,
 - interrupting the power supply to the device under test in the event of a latch-up.

Attention! Make sure that internal functional faults are visible from outside. The device under test may be destroyed due to an increase in the injection intensity if the faults are not visible from outside. Take the following precautions if necessary:

- monitor representative signals in the device under test with optical sensors
- special test software
- visible reaction of the device under test to inputs (reaction test of the device under test).

We cannot assume any liability for the destruction of devices under test!

5 Warranty

Langer EMV-Technik GmbH will remedy any fault due to defective material or defective manufacture during the statutory warranty period.

This warranty is only granted on condition that:

- the instructions in the user manual are observed,
- only original spare parts are used.
- external components such as power supply units, etc. have separate warranty terms and conditions which are applicable for the respective manufacturer.

The warranty will be forfeited if:

- unauthorized repairs have been made to the Langer EMV-Technik GmbH product,
- the product from Langer EMV-Technik GmbH has been modified,
- the product from Langer EMV-Technik GmbH has not been used correctly.

6 Technical specifications

6.1 Maximum values

	Min	Type	Max
Trigger input	-6 V		6 V
Supply voltage	-20 V		15 V

Table 1

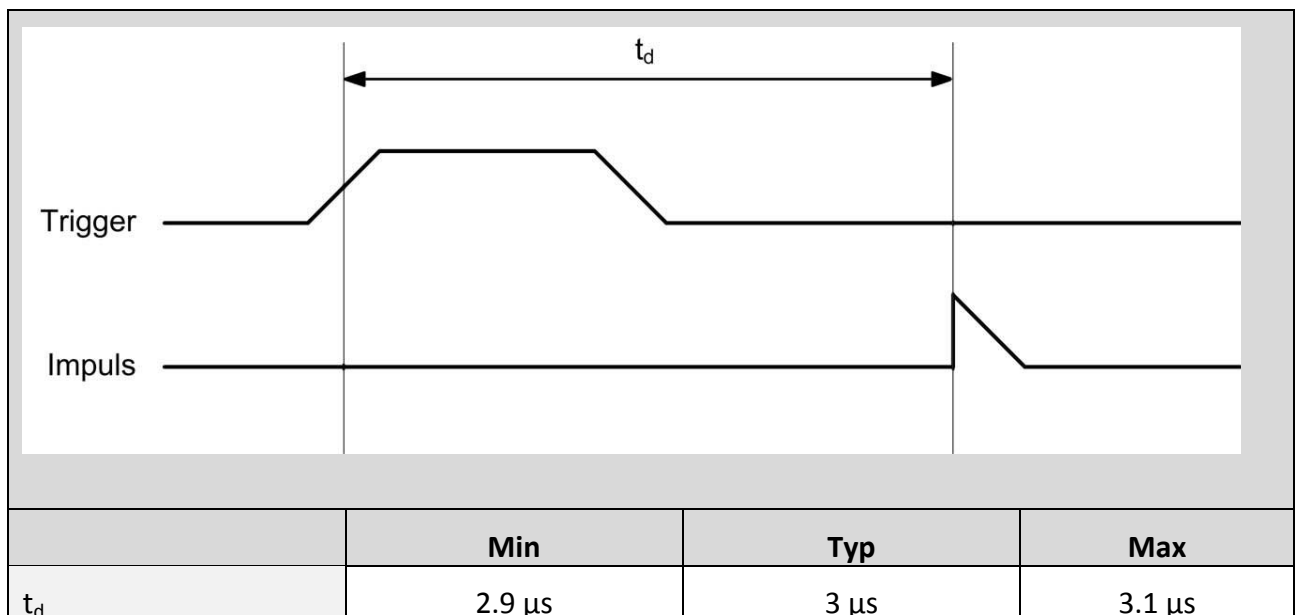
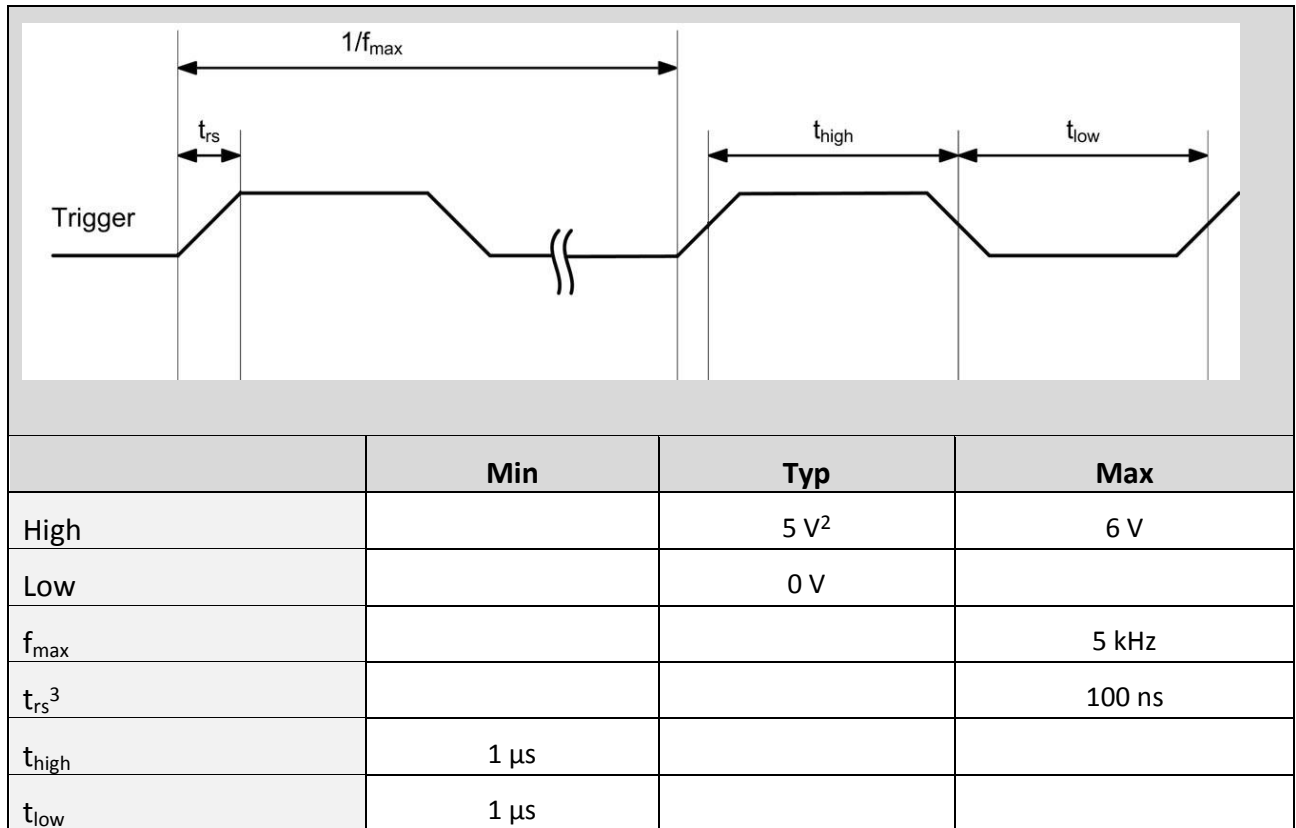
6.2 General technical data

	P11t	P12t
Field configuration at the tip of the mini-burst field generator	radial	circular
Generator voltage	400 V	
Generated field strength	approx. 1 mT	
Pulse sequence	Individual pulse up to 5 kHz ¹ (external trigger)	
Adjustable pulse width	2 ns – 8 ns	
Trigger input (SMB)	5 V TTL	
Trigger-to-pulse delay	3 µs	
Pulse polarity	reversible	
Supply voltage	external 6.5 V – 15 V	
Current input	50 mA @ 6.5 V	
Dimensions	125 x 24 x 20 mm	
Weight	approx. 20 g	

Table 2

¹ The mini-burst field generators can be operated up to 10 kHz; the interference effect hereby decreases by approx. 10%.

6.3 Trigger parameters

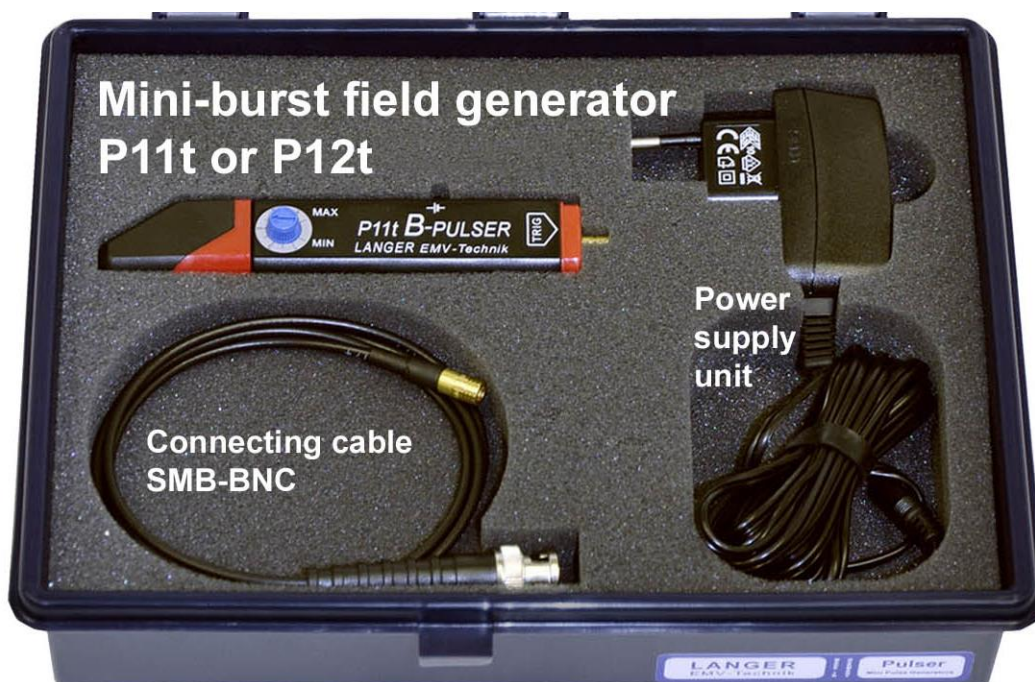


² The mini-burst field generators can be operated up to 10 kHz; the interference effect hereby decreases by approx. 10%.

³ Triggering takes place on the rising edge.

7 Scope of delivery

Item	Designation	Type	Parameter	Quantity
01	Mini-burst field generator	P11t or P12t		1
02	Power supply unit		12 V, 270 mA	1
03	Connecting cable	SMB - BNC	1 m	1
04	Case insert			1
05	User manual			1
06	Case			1



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