



IC TEST SYSTEM

High-voltage power supply unit
BPS 203
for ESD probes

Operation manual



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1 System components

1. Hardware

BPS 203 high-voltage power supply unit

12 V power supply unit

USB cable

Control cable

High-voltage cable (HV cable)

Documentation and operation manual

2. Available probes

P331 ESD generator (200 ps)

P331-2 ESD generator (IEC 61000-4-2)

P1202 ESD H-field injection probe (200 ps)

P1202-2 ESD H-field injection probe (IEC 61000-4-2)

P1302 ESD E-field injection probe (200 ps)

3. Software

BPS203-Client

Driver for Windows

4. Storage case

2 Design of the burst system

2.1 Overview of functions

The BPS 203 can only be used with a probe from Langer EMV-Technik GmbH. Different probes are provided for the injection of ESD pulses.

The probes' design is adapted to the mechanisms used for injecting ESD pulses into electronic modules. The BPS 203 is used to supply and control the probes.

Figure 1 shows the interaction of the individual components in a potential measurement setup.

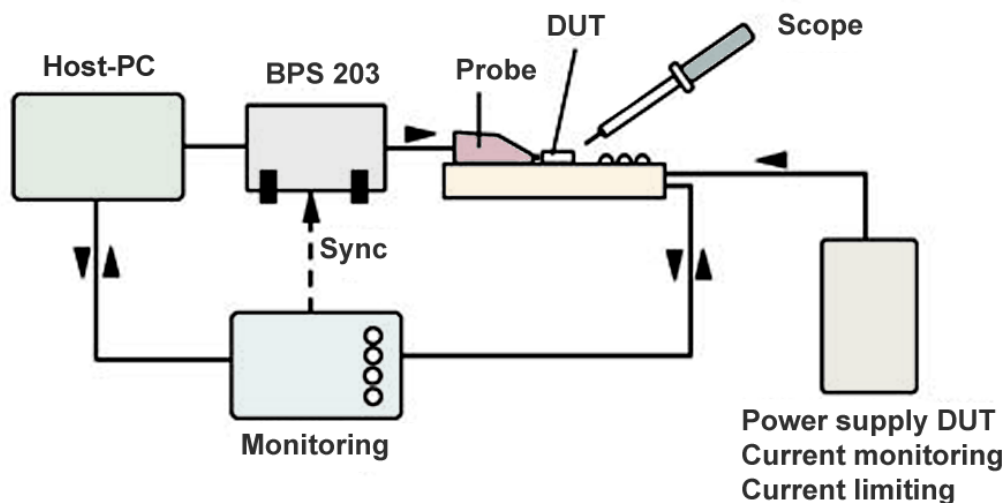


Figure 1 – Components of a potential measurement setup

The device under test (DUT) is mounted on a GND plane (not included in the scope of delivery) via which it can be supplied, controlled and monitored. The probe is placed on the GND plane to ensure an optimum ground connection and moved towards the device under test. The BPS 203 supplies the required high voltage and controls the probe. The BPS 203 is controlled via a PC and corresponding BPS 203-Client control software. The control software provides the following functions:

- Automatic recognition of the probe connected to the BPS 203
- Set the repetition frequency
- Set the high voltage
- Set the polarity
- Generate alternating ESD pulses
- Generate a defined number of ESD pulses

2.2 System description

The BPS 203 is used as a high-voltage power supply and control unit for the whole range of ESD probes. The components are set up according to Figure 1 with the P331 ESD generator as an example. The GND 25 ground plane and corresponding adapter are not included in the scope of delivery. A PC is used to control the measurement system via a USB interface and the BPS 203-Client software (not shown in the figure). The BPS 203 generates a high voltage (up to 9.5 kV). The unit supplies this to the probe via the HV cable and controls the respective probe connected to the system via the control cable.

Attention!

The BPS 203 ONLY functions in conjunction with the different ESD probes from Langer EMV-Technik GmbH. The connected probe generates the ESD pulse using the high voltage.

The following probes are available for the system:

1. P331 and P331-2: The P331 probe is used to inject steep-edged ESD pulses into interface coupling networks (Ethernet, LVDS, USB, ...). The pulses can also be injected directly into the pins of an IC. The IC may be destroyed if a pulse is injected directly into a pin! Figure 1 shows a measurement setup with the P331 probe.
2. P1202 and P1202-2: The P1202 and P1202-2 probes are used to generate a magnetic ESD field.
3. P1301: The P1301 probe is used to generate an electric ESD field.

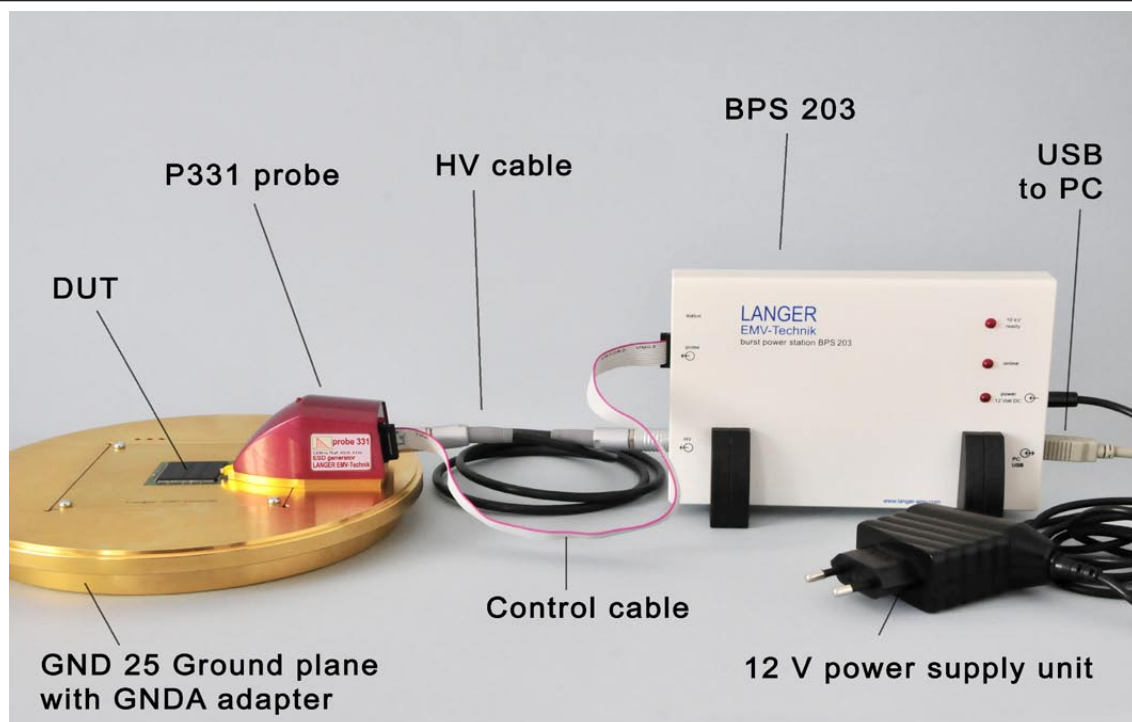


Figure 2: Measurement setup with a P331 as an example

2.3 Starting up the BPS 203

The BPS 203 is started up according to the following procedure:

1.
Connect the 12 V power supply unit to the **Power 12 V DC** port on the BPS 203 (Figure 3).

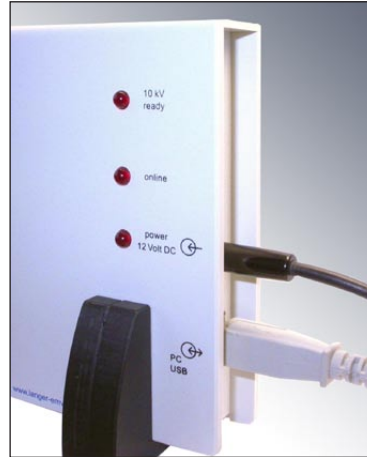


Figure 3: 12 V power supply unit and USB ports

2.
Connect the USB cable to the **PC USB** port on the BPS 203 and the PC.

3.
Connect the probe to the BPS 203 with the HV cable (Figure 4).



Figure 4: Connecting the BPS 203 to the probe

4.
Connect the probe to the BPS 203 with the control cable.

5.
Contact the **DUT** with the probe (Figure 5).



Figure 5: Contacting the DUT

6. Install the driver and start the BPS203-Client software as described in the software section. .

2.4 LED status information

The Status LED (Figure 6) indicates the BPS 203's operating states.



Figure 6: LED information

Status LED of the BPS 203

	10 Hz	Fault! The probe is not or only incorrectly connected.
	2 Hz	The probe is ready.
	2 Hz	In operation

2.5 Operating modes of the BPS 203

The BPS 203 can generate the following types of ESD pulses in connection with a probe:

- E- Single pulse
- Continuous burst pulses
- Defined pulse sequence

2.6 Operation of several BPS 203 units on a computer

Several BPS 203 units can be connected to a single computer. Do so by connecting each of the BPS 203 units to its own USB port on the computer as shown in the *Start-up of the BPS 203* section. Start the BPS203-Client software as often as BPS 203 units are connected to the computer and are to be used. Finally, set the USB port for the respective BPS 203 unit in each of these BPS 203-Client entities.

3 Software

3.1 Installation requirements

- Operating system: from Windows XP
- USB port: 1.x or higher
- CD/DVD drive

3.2 Driver installation

Administrator rights for the PC are needed to install the device driver.
Procedure for installing the device driver from the enclosed CD:

1. Connect the BPS 203 to the 12 V power supply unit. The **Power** LED comes on permanently and the **Status** LED flashes on the BPS 203 unit.
2. Connect the BPS 203 unit to the PC with the USB cable.
3. After the operating system has *found the new hardware*, the CD is identified as the source for the required device drivers and the installation process continues.

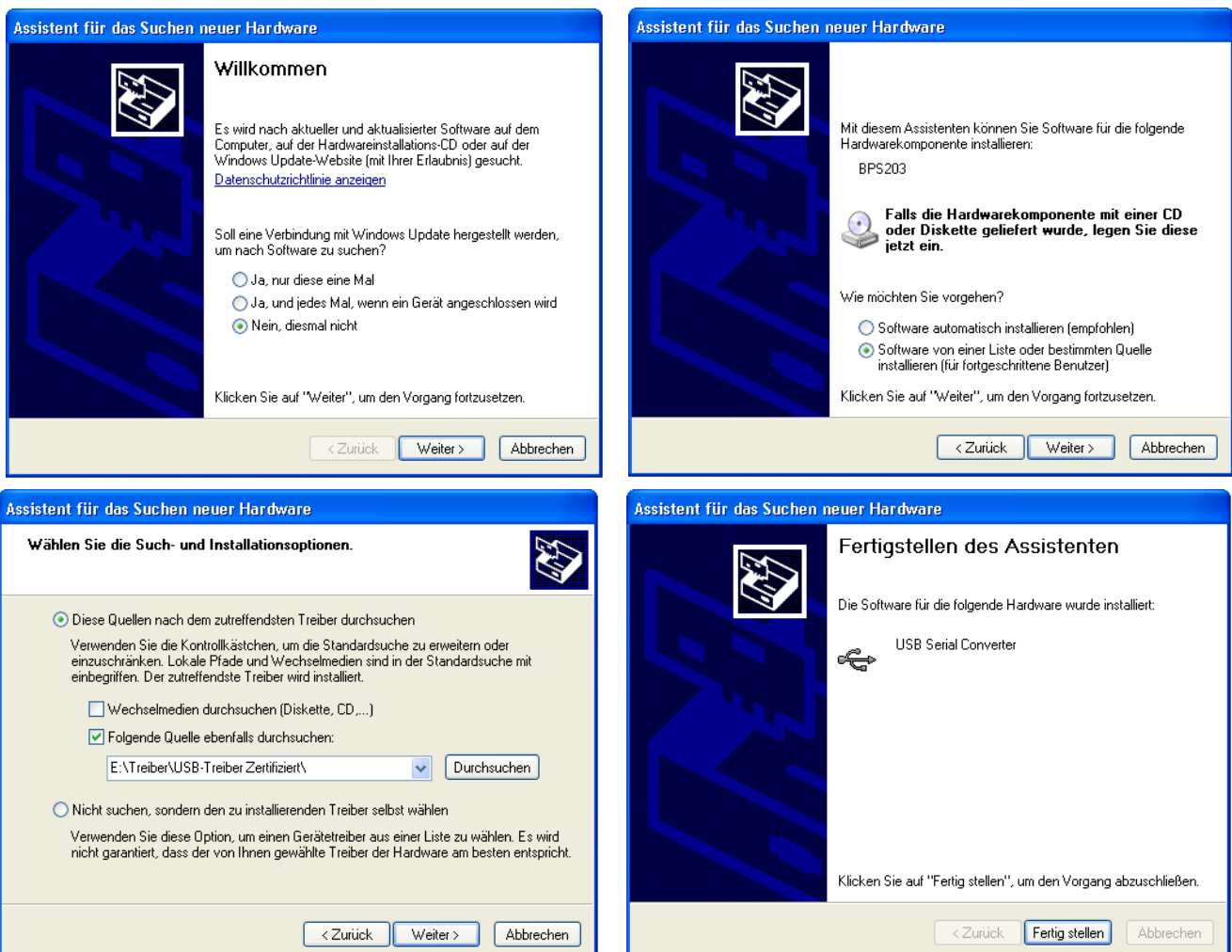


Figure 7: LED information

3.3 BPS 203-Client control software

The **BPS203_Client.exe** software on the enclosed CD is used to control the BPS 203 unit. It can be started directly from the CD or other data carriers and need not be installed.

3.3.1 Setting the frequency

The frequency of the ESD pulses can be set in the **Burst Frequency** box of the user interface (Figure 8) within a range from 0.1 Hz to 10 Hz. The useful frequency range adjusts automatically to the respective probe that is connected. Whereas the slider is used to enter a rough frequency, the spin buttons permit a fine adjustment.

The burst frequency can be set at any time before the BPS203 is started as well as in the *Continuous burst pulses* and *Defined number of pulses* operating modes.

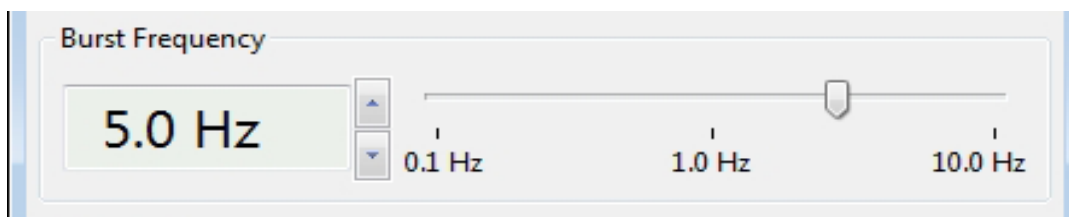


Figure 8: Setting the frequency

3.3.2 Setting the voltage

The voltage of the ESD pulses can be set in the **Burst Level** box of the user interface (Figure 9) within a range from 0.1 kV to 9.5 kV. The useful voltage range adjusts automatically to the respective probe that is connected. Whereas the slider is used to enter a rough frequency, the spin buttons permit a fine adjustment.

The voltage can be set at any time before the BPS 203 is started as well as in the *Continuous burst pulses* and *Defined number of pulses* operating modes.

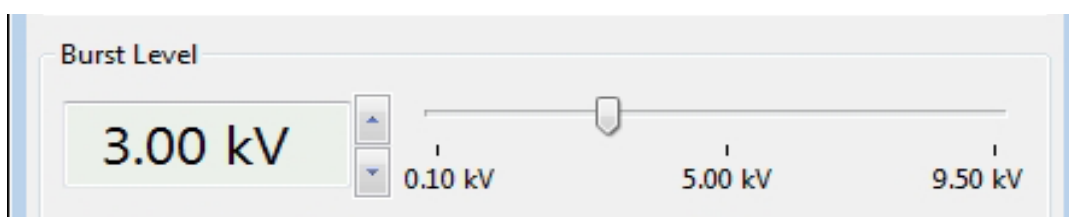


Figure 9: Setting the voltage

3.3.3 Setting the options

Further characteristics of the ESD pulses to be generated can be set in the **Burst Options** section of the user interface (Figure 10).

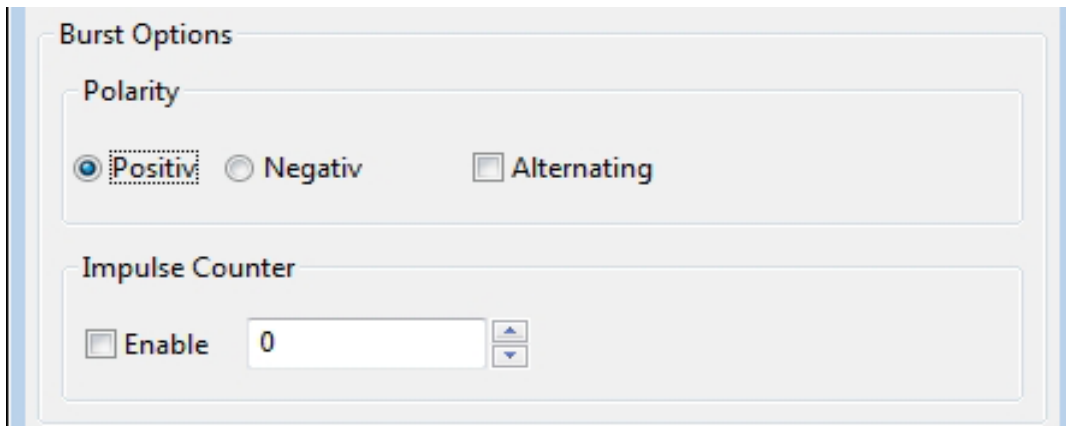


Figure 10– Setting the options

Polarity

The polarity of the pulses can be switched to **Positive** or **Negative** in the selection box. The polarity of the pulses changes automatically after each pulse that is generated if the **Alternating** option is activated. The polarity of the first pulse corresponds to the set polarity.

The polarity can only be changed before the BPS 203 has been started.

Defined pulse sequence

The **Impulse Counter** option can be activated for a pulse sequence with a fixed number of pulses by ticking the **Enable** checkbox. A number of pulses between 1 and 1,000,000 can be entered in the entry box and **must be confirmed with the Enter key**. The pulse sequence is started by pressing the **Start key**.

3.3.4 Operating modes

Single pulse

The BPS 203 generates a single pulse at the set voltage and polarity if the **Single** key is pressed (Figure 11). The **Status** LED flashes once. The pulse polarity changes automatically each time the **Single** key is pressed if the **Alternating** option has been activated. The polarity of the first pulse corresponds to the set polarity.

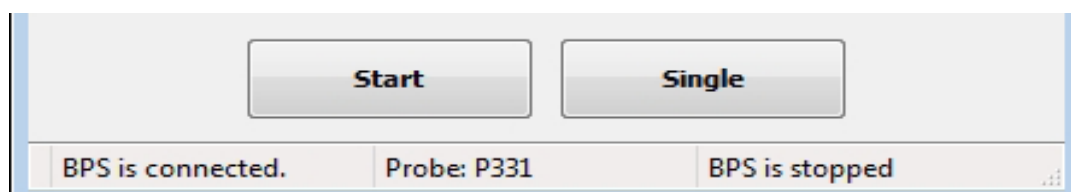


Figure 11: Active keys: Start and Single

Continuous pulses

The BPS 203 generates continuous ESD pulses at the set frequency, voltage and polarity when the **Start** key (Figure 11) is pressed if the **Impulse Counter** option has not been activated. The Status LED flashes continuously during the pulse output. The status message **BPS is running** appears in the BPS 203-Client status bar. The **Start** key becomes the **Stop** key (Figure 12) and, if pressed, interrupts the pulse generation of the BPS 203 at any time. The polarity of the pulses changes automatically after each pulse that is generated if the **Alternating** option has been activated. The polarity of the first pulse corresponds to the set polarity. The frequency and voltage can be changed during operation.

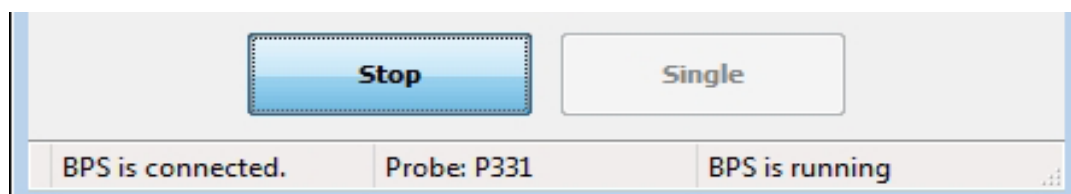


Figure 12: Start / Stop key for continuous pulses

Defined pulse sequence

The BPS 203 unit generates the number of ESD pulses that was entered and confirmed with Enter when the **Start** key is pressed if the **Impulse Counter** option has been activated (Figure 13). The **Status** LED flashes continuously during the pulse output. The status message **BPS is running** appears in the BPS 203-Client status bar. The **Start** key becomes the **Stop** key (Figure 12) and, if pressed, interrupts the ESD pulse generation of the BPS 203 at any time. The value of the entered number of pulses is decremented as a check (Figure 14) after each pulse that is generated. The polarity of the pulses changes automatically after each pulse that is generated if the **Alternating** option has been activated. The polarity of the first pulse corresponds to the set polarity. The frequency and voltage can be changed during operation.

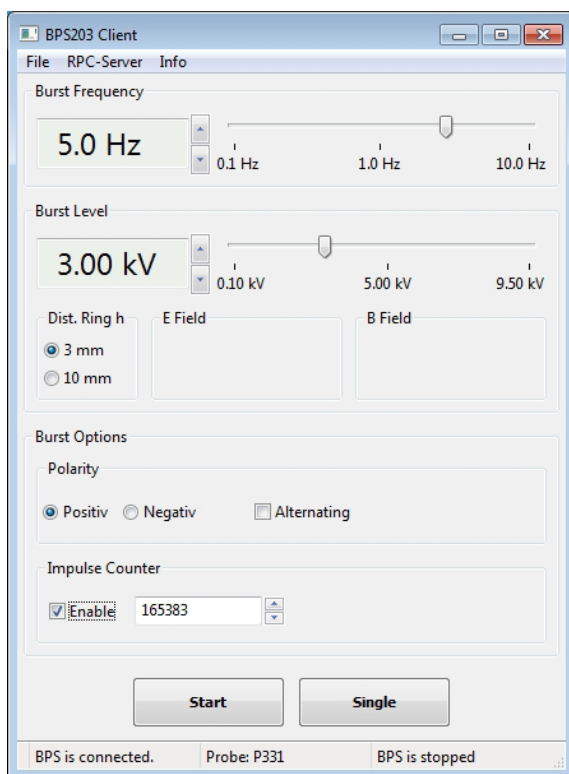


Figure 13 – Impulse Counter option has been activated

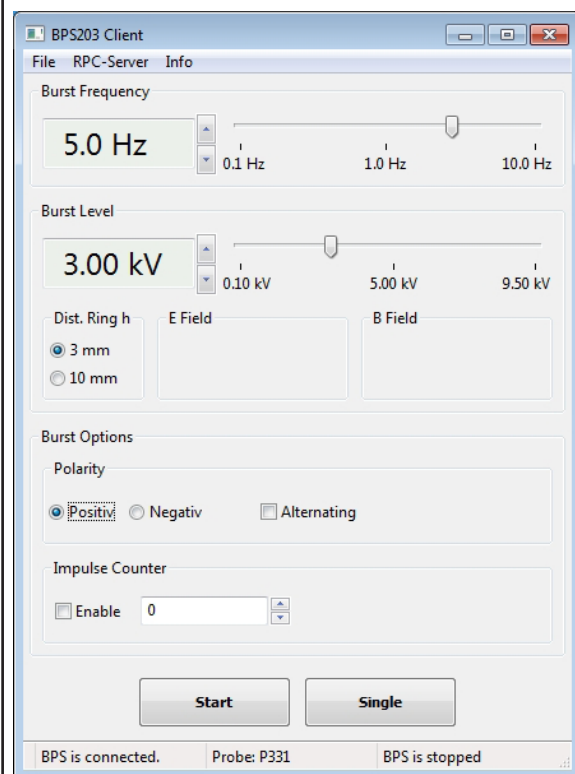


Figure 14 - Defined pulse sequence

3.3.5 Status bar messages

The status bar of the BPS 203-Client is split into three parts (Figure 15). The status of the USB connection to the BPS 203 appears on the left. The central part is assigned to automatic probe recognition and indicates the probe that is currently connected. The operating state of the BPS 203 is shown on the right.

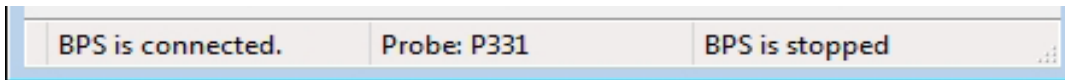


Figure 15: Status bar of the BPS 203-Client

- Potential messages with respect to the USB connection to the BPS 203
 - **BPS is disconnected** (no connection to the BPS 203)
 - **BPS is connected**
- Potential messages with respect to automatic probe detection
 - **Probe: NoProbe** (no probe connected)
 - **Probe: <ProbeName>** (e.g. Probe: P331)
- Potential messages with respect to the BPS 203's operating state
 - **BPS is in unknown state** (unknown state if there is no connection to the BPS 203)
 - **BPS is stopped**
 - **BPS is running** (BPS 203 generates the pulses or pulse sequence that has been defined)

4 Using the probes

4.1 P331 - ESD generator (200 ps)

The probe is used to generate ESD pulses with a high edge steepness that can be injected via conductors. The steep-edged 200 ps ESD pulse is generated in the probe from the high voltage. The ESD pulse is provided at the pin contact, i.e. at the probe's HV output.

The probe 331 can only be operated in conjunction with the BPS 203 control station!

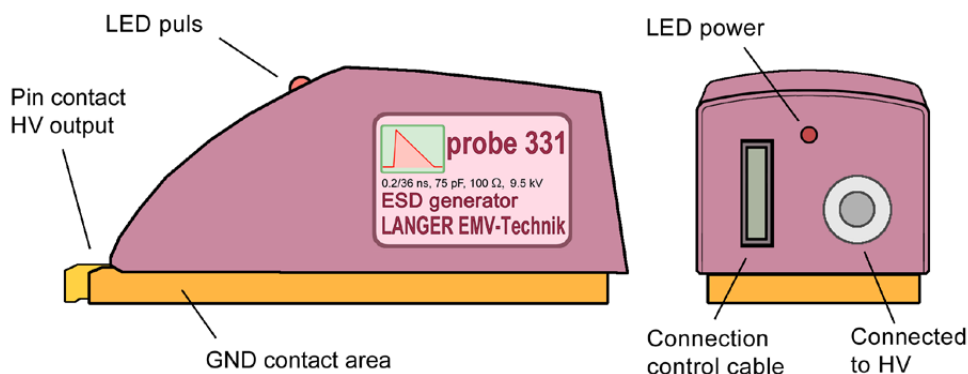


Figure 16: Description of P331 connections

Use:

ESD injection directly into IC pins or in connection with couplers into interface pins, especially high-speed interfaces such as USB, LVDS, Ethernet etc., i.e. via a conductor.

Characteristics:

ESD pulse (for pulse shapes see below)

- Triggering of the probe via BPS 203
- User interface on PC

Pulse shape

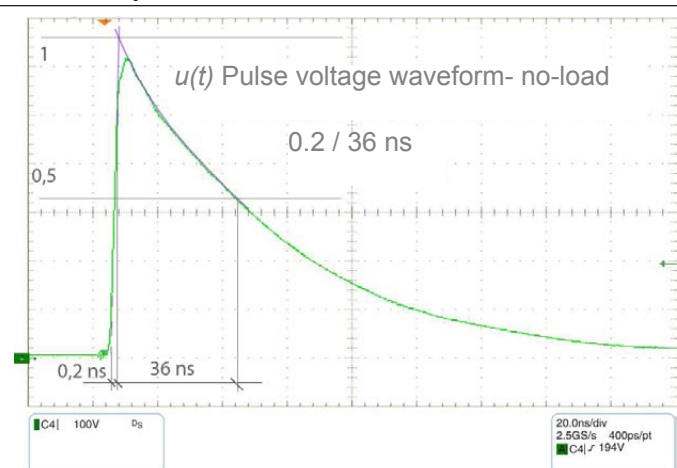


Figure 17: Pulse voltage waveform of P331

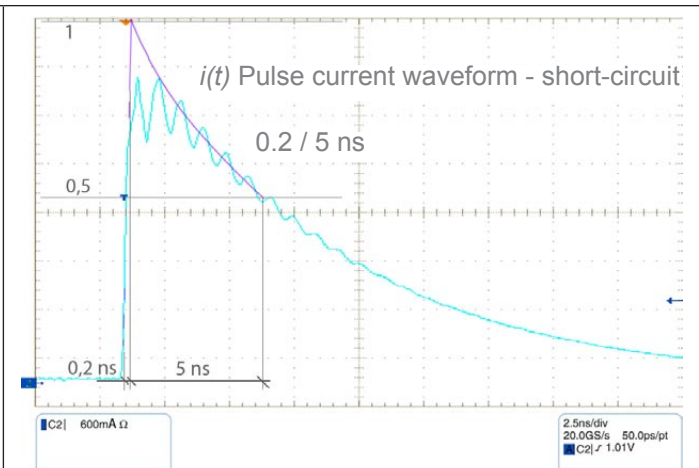


Figure 18: Pulse current waveform of P331

The BPS 203's equivalent circuit diagram with a P331 probe:

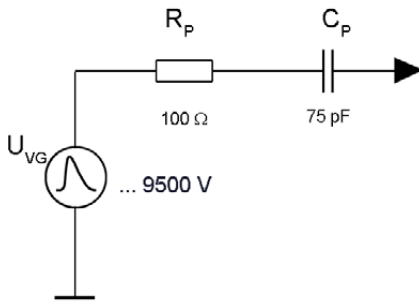


Figure 19: BPS 203's equivalent circuit diagram with a P331

The maximum short-circuit current that occurs when the probe is used can be calculated from the generator voltage U_{VG} .

$$I_p = U_{VG} K$$

where: $K = 8.88 \text{ A / kV}$

The probe supplies 8.88 A per kV of the generator voltage.

The maximum no-load voltage of the pulse can be calculated from:

$$U_p = 0.8 U_{VG}$$

4.2 P331-2 - ESD generator (IEC 61000-4-2)

The probe is used to generate standard ESD pulses according to IEC 61000-4-2 for ESD injection via conductors. The standard ESD pulse is generated in the probe from the high voltage and provided at the pin contact, i.e. at the probe's HV output.

The probe 331-2 can only be operated in conjunction with the BPS 203 control station!

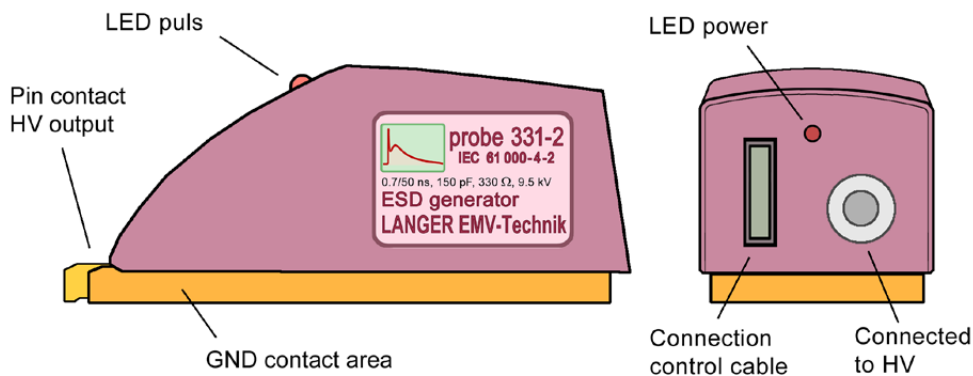


Figure 20: Description of P331-2 connections

Use:

ESD injection according to the standard IEC 61000-4-2 directly into IC pins or, in connection with couplers, into interface pins, especially high-speed interfaces such as USB, LVDS, Ethernet etc., i.e. via a conductor.

Characteristics:

Standard ESD pulse according to IEC 61000-4-2 (for pulse shapes see below)

- Triggering of the probe via BPS 203
- User interface on PC

Pulse shape (analogous to IEC 61000-4-2)

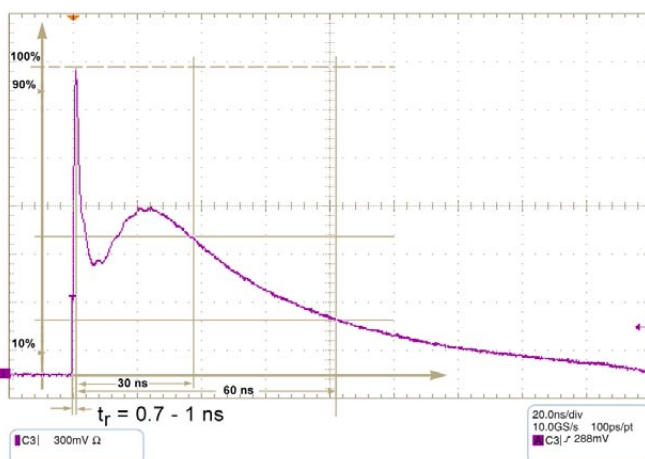


Figure 21: Pulse shape of P331-2

Equivalent circuit diagram

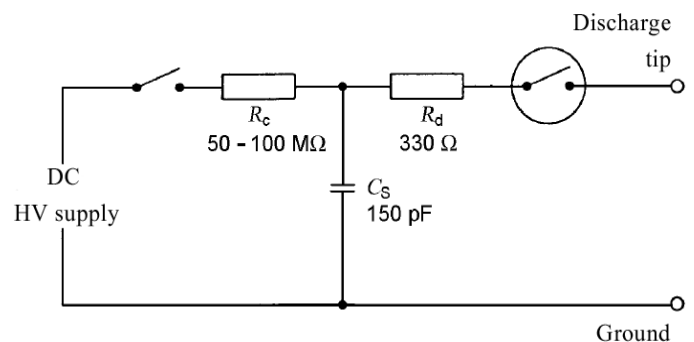


Figure 22: Equivalent circuit diagram P331-2

The maximum short-circuit current that occurs when the probe is used can be calculated from the generator voltage U_{VG} .

$$I_p = U_{VG} K$$

where:

$$K = 3.9 \text{ A / kV}$$

The probe supplies 3.9 A per kV of the generator voltage.

The maximum no-load voltage of the pulse can be calculated from:

$$U_p = 0.8 U_{VG}$$

Note:

The pulse shape can only be guaranteed if the P331-2 probe is operated at a **minimum voltage of 200 Volt.**

5 Safety and warranty

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)

5.1 Safety instructions

When using a LANGER EMV Technik product, please observe the following safety instructions to protect yourself against electric shocks or the risk of injuries:

- Read and follow the operating instructions and keep them in a safe place for later consultation.
- 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. People with a pacemaker, for example, are excluded from this work.
- Observe the safety instructions and warnings provided on the product.
- Carry out a visual check of the LANGER EMV-Technik product before using it.
- Never leave a Langer EMV-Technik product unattended whilst this is in operation.
- Read the explanation of the symbols on the product in the operation manual.
- The LANGER EMV-Technik product may only be used for its intended purpose. Any other use is prohibited.
- Do not switch the LANGER EMV-Technik product on until it has been fully installed.
- Do not use damaged connecting cables, they are dangerous!
- **Attention!**
Functional near fields and interference emissions may occur when the LANGER EMV-Technik product is operated, in particular in connection with a test set-up. 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 emission).
- **Attention!**
We cannot assume any liability for the destruction of devices under test!

5.2 Safety symbols



This symbol in connection with another symbol, terminal or device indicates that the user should refer to the operating instructions for more information so as to avoid personal injuries and material damage in connection with the LANGER EMV-Technik product.



This ATTENTION symbol indicates a potentially dangerous situation which arises if minor damage to the LANGER EMV-Technik product is ignored.

5.3 Warranty

We will remedy any fault due to defective materials or defective manufacture, either through a repair or by supplying spare parts, during the statutory 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.
- The operating instructions are observed.
- Only original spare parts are used.
- External components such as power supply, connecting cable, etc. have separate warranty terms and conditions which are applicable to the respective manufacturer.

The warranty will be 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.

6 Technical Data

BPS 203 - Burst power station

Dimensions (width/height/depth)	175/122/61 (mm)
Weight	0.35 kg
Triggering / Signal output	USB
Software	BPS203-Client control program
Supply voltage	12 V/1 A DC
Frequency range	0.1 Hz - 10 Hz (depending on the connected probe)
Voltage range	100 V - 10.5 kV (depending on the connected probe) Polarity: +/- or alternating

P331 - ESD generator (200 ps)

Dimensions (width/height/depth)	79/41/40 (mm)
Weight	0.25 kg
Frequency range	0.1 Hz - 10 Hz
Voltage range	100 V - 9.5 kV
Pulse shape	0.2 / 36 ns
Energy storage capacity	75 pF
Internal resistance	100 Ω

P331-2 - ESD generator (IEC 61000-4-2)

Dimensions (width/height/depth)	79/41/40 (mm)
Weight	0.25 kg
Frequency range	0.1 Hz - 10 Hz
Voltage range	100 V - 9.5 kV
Pulse shape	0.7 / 60 ns
Energy storage capacity	150 pF
Internal resistance	330 Ω