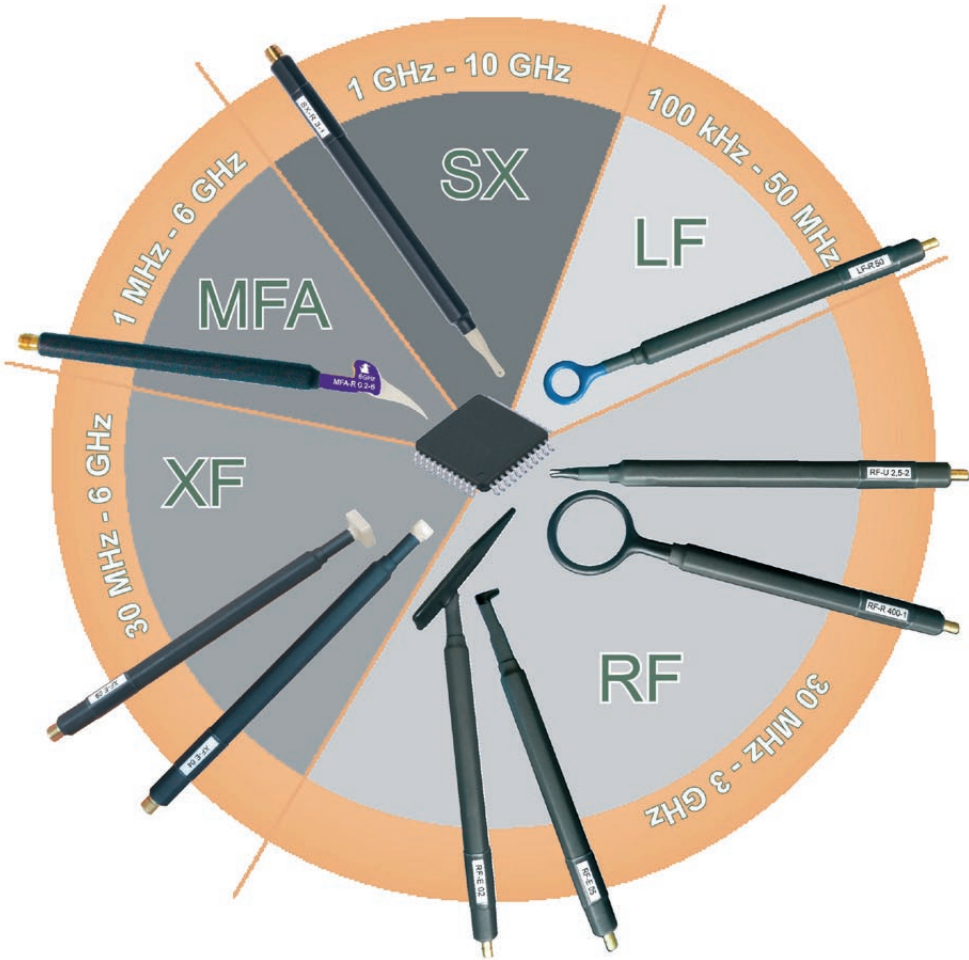




# Product overview

## PCB - EMC





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**E1 set**

## Immunity Development System

**SGZ 21 burst Generator:**

Pulse parameter:

Rise time: ca. 2 ns

Tail time: ca. 10 ns

Peak values: ca. 0...1500 V

Optical input:

Optical fiber: 2.2 mm

Max. frequency: 5 MHz

Min. pulse width: 100 ns

Supply voltage: 12 V / 200 mA

Sizes (L x W x H): (154 x 100 x 62) mm

- 1x SGZ 21 (Burst Generator)
- 1x S21 (Optical Sensor (10 Mbps))
- 1x BS 02 (Magnetic Field Probe)
- 1x BS 04DB (Magnetic Field Source)
- 1x BS 05D (Magnetic Field Source)
- 1x BS 05DU (Magnetic Field Source)
- 1x ES 00 (E-Field Source)
- 1x ES 01 (E-Field Source)
- 1x ES 02 (E-Field Source)
- 1x ES 05D (E-Field Source)
- 1x ES 08D (E-Field Source)
- 1x MS 02 (Magnetic Field Probe)
- 1x E1 acc (Accessories)
- 1x NT FRI EU (Power Supply Unit)
- 1x E1 case (System Case)
- 1x E1 m (E1 Set User Manual)

The E1 is a set of EMC tools used for EMI suppression in printed circuit boards during the development phase. The developer can use the E1 set to quickly identify the causes of burst and ESD interference. This allows the developer to design suitable measures to solve the causes of the interference. It can also be used to test the effectiveness of the measures taken. The E1 test set-up is small and fits easily on a developer's desk.

The E1 set user manual describes EMC mechanisms and provides detailed descriptions of basic measuring strategies for interference suppression in printed circuit boards. The E1 set includes a generator to generate burst and ESD disturbances.

**S2 set**

## Magnetic Field Probes for E1

- 1x MSA 02 (Magnetic Field Probe (active))
- 1x 05K black (Probe Head for MSA 02)
- 1x 05R white (Probe Head for MSA 02)
- 1x 05U orange (Probe Head for MSA 02)
- 1x MS 101 (Magnetic Field Probe)
- 1x MS 102U (Magnetic Field Probe)
- 1x S2 case (System Case)
- 1x S2 m (S2 Set User Manual)

The S2 set contains active and passive magnetic field probes. They measure the nonreactive fast transient pulse magnetic fields in electronic devices and assemblies under interference. Burst and ESD processes, which cause problems in the device under test, can be analyzed. The magnetic field probes transmit the measured signals via the LWL connection to the optical receiver of the SGZ 21. The S2 set can only be used with the SGZ 21 burst generator.

**P1 set**  
Mini Burst Field Generators

**Generated E-field strength:** ca. 100 kV/m  
**Generated magnetic flux density:** ca. 1 mT  
**Pulse parameter:**  
 Rise time: 1.8 ns ... 10 ns  
 Frequency: single / 5 kHz  
**Supply voltage :** 1.5 V / AAA

- 1x P11 (Mini Burst Field Generator (B))
- 1x P12 (Mini Burst Field Generator (B))
- 1x P21 (E-mini Burst Field Generator)
- 1x P1 case (Mini Burst Field Generators Case)
- 1x P1 m (P1 Set User Manual)

The mini burst field generators are particularly small. They are used to identify and eliminate weak points in electronic assemblies in the development phase. They generate a burst or an ESD field at their tip. The mini burst generators are guided by hand across the equipment under test (e.g. printed circuit board) with their field-emitting tips close to its surface. The weak points respond to the pulsed field and malfunctions will occur. The burst field generators can be applied to selected individual sections of the circuit board design to identify potential weak points (faults in the ground system, individual traces or IC pins). Separate magnetic (P11 and P12) and electric (P21) coupling allows an optimal adaptation of EMC countermeasures to the respective weak point.

**P23 set**  
E-Mini Burst Field Generator

**Generator voltage:** 1.2 kV  
**Coupling capacity:** 10 pF  
**Pulse parameter:**  
 Rise time: 1.8 ns ... 10 ns  
 Frequency: single / 5 kHz  
**Supply voltage :** 1.5 V / AAA

- 1x P23 (E-mini Burst Field Generator)
- 1x A6 case (System case)
- 1x P23 m (P23 Set User Manual)

The P23's interference pulse runs through and couples to the digital IC inputs under test, like Reset, Clock, Quartz or the respective signal lines. The extremely thin tip of P23 is suitable for testing finest structures.



**P11t set**

Mini Burst Field Generator (B, Trigger)

**External trigger input:** SMB, male, jack; 5 V TTL**Generated magnetic flux density:** ca. 1 mT**Pulse parameter:**

Rise time: 1.8 ns ... 10 ns

Frequency: single ... 10 kHz

**Trigger-pulse delay:** 3  $\mu$ s**Supply voltage :** 6.5 V ... 15 V

- 1x P11t (B-mini Burst Field Generator)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x NT FRI EU (Power Supply Unit)
- 1x P11t case (System Case)
- 1x P11t m (P11t Set User Manual)

The P11t mini burst field generator is a development accompanying tool for interference immunity analysis. The fast transient magnetic fields, which emerge out of its tip, are used for detecting weak spots on the assemblies. The mini burst field generator has a TTL trigger input. Signals from the device under test or an external control logic can be used for synchronizing magnetic field interferences. This allows for a precise interference immunity analysis of complex circuits during certain operating conditions.

**P12t set**

Mini Burst Field Generator (B, Trigger)

**External trigger input:** SMB, male, jack; 5 V TTL**Generated magnetic flux density:** ca. 1 mT**Pulse parameter:**

Rise time: 1.8 ns ... 10 ns

Frequency: single ... 10 kHz

**Trigger-pulse delay:** 3  $\mu$ s**Supply voltage :** 6.5 V ... 15 V

- 1x P12t (B-mini Burst Field Generator)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x NT FRI EU (Power Supply Unit)
- 1x P12t case (System Case)
- 1x P12t m (P12t Set User Manual)

During the development phase the P12t mini burst field generator can be used to detect weak spots on assemblies. Fast transient magnetic field flows from the tip that follows the principle of a coupling clamp. The mini burst field generator has a TTL trigger input. Signals from out of the device under test or an external control logic can be used to synchronize the magnetic disturbance field. This allows for a precise noise immunity analysis of complex circuits during certain operating conditions.



### H3 set

#### Field Sources

- 1x BS 02-h (Magnetic Field Probe)
- 1x BS 04DB-h (Magnetic Field Source)
- 1x BS 05DB-h (Magnetic Field Source)
- 1x BS 05DU-h (Magnetic Field Source)
- 1x ES 00-h (E-Field Source)
- 1x ES 01-h (E-Field Source)
- 1x ES 02-h (E-Field Source)
- 1x ES 05D-h (E-Field Source)
- 1x ES 08D-h (E-Field Source)
- 1x HV SHV-SMB 1 m (High-Voltage Cable, SHV SMB)
- 1x H case (System Case)
- 1x H3 m (H3 Set User Manual)

The field sources are used to analyze the immunity of assemblies and devices by coupling pulse fields (ICE 61000-4-4) into the device under test. They must be guided by hand just above the device under test. The weak spot will react to the pulse field and malfunctions will be triggered.

An EFT/burst generator powers the field sources via a high voltage cable. The field sources have a SMB-output.

The connection cable for the field sources is available with a SHV connector (HV SHV-SMB 1 m) or with a Fischer connector (HV FI-SMB 1 m; Fischer connector S103A023). Please specify when ordering.



### PT4 set

#### EFT Generator Set

#### PT4 Burst Transformer:

Max. burst voltage: 4.5 kV

Transformation ratio: 1:1

Dielectric strength of outputs: 500 V / DC, AC 50 Hz

- 1x PT4 (Burst Transformer)
- 1x BS 04DB-h (Magnetic Field Source)
- 1x ES 05D-h (E-Field Source)
- 1x HV SHV-SMB 1 m (High-Voltage Cable, SHV SMB)
- 1x PT4 acc (Accessories)
- 1x PT4 case (System Case)
- 1x PT4 m (PT4 Set User Manual)

The PT4 set is used to analyze immunity of assemblies and devices efficiently. The PT4 burst transformer converts the pulses of the EFT/burst generator into potential free burst pulses. These are injected into individual sections of the device under test, enabling the developer to locate its susceptible areas.

The set includes a magnetic and an electric field source which are also supplied by the EFT/burst generator. The field, which emerges from the head of the field source, is used to scan the surface of the device under test. This allows the weak spots to be located with precision and assigned to the fault patterns that occur in compliance tests.

The burst transformer and the connecting cable come with either an SHV plug (HV SHV-SMB 1 m) or a Fischer plug (HV FI-SMB 1 m). Please select the desired connector/plug when ordering.

**OSE 150-1 set**

Optical Fibre Probe 1-channel, 50 Mbps

**OE 150 Optical Receiver:**

Transmission range: DC ... 50 Mbps

Supply voltage : 12 V / 100 mA

Optical fibre length: 1 m - 20 m

**S25 Optical Sensor:**

Transmission range: DC ... 50 Mbps

Supply voltage: 3 V ... 18 V

Current input: 30 mA

- 1x OE 150 (Optical Receiver)
- 1x S25 (Optical Sensor (50 Mbps))
- 1x LWL Ø 2.2 mm 1.5 m (Optical Fibre Single 1.5 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x OSE 150-1 acc (Accessories)
- 1x OSE 150-1 case (System Case)
- 1x Digital m (OSE User Manual)

The OSE 150-1 set is used to transmit digital signals from a disturbed device under test (EFT/burst interference). The set consists of one sensor which detects logical signals and transforms them into optical signals. The light signals are transmitted to the optical receiver via a fibre optical cable. The receiver transforms them into digital electric signals. These can be visualised with an oscilloscope or can be used for the control of other devices.

Different types of sensors with different measuring ranges are available for detecting logical signals in the device under test. Several sensor types with different measuring ranges are available. The S25 or S21 can be chosen when placing your order. The light signals are transmitted to the optical receiver via a fibre optical cable. The system is suitable for signal monitoring from an anechoic chamber, a shielded RF chamber or in an EMC test lab. The optical transmission system allows EMC-optimizing of hard- and software, because disturbed signals can be easily detected.

**OSE 150-2 set**

Optical Fibre Probe 2-Channel, 50 Mbps

**OE 150 Optical Receiver:**

Transmission range: DC ... 50 Mbps

Supply voltage : 12 V / 100 mA

Optical fibre length: 1 m - 20 m

**S25 Optical Sensor:**

Transmission range: DC ... 50 Mbps

Supply voltage: 3 V ... 18 V

Current input: 30 mA

- 2x OE 150 (Optical Receiver)
- 2x S25 (Optical Sensor (50 Mbps))
- 2x LWL Ø 2.2 mm 6 m (Optical Fibre, Single 6 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x OSE 150-2 acc (Accessories)
- 1x OSE 150-2 case (System Case)
- 1x Digital m (OSE User Manual)

With the OSE 150-2 set it is possible to potentially free oscillograph digital signals under EFT/burst interference. Disturbed signals from the device under test can be easily detected.

The set consists of two single sensors which are used to detect two digital signals within the device under test. It is connected via two fibre optical cables and two receivers to the oscilloscope. Inside the device under test a sensor transforms measured logical signals into light signals.

Different types of sensors with different measuring ranges are available for the detection of logical signals in the device under test. Several sensor types with different measuring ranges are available. Either S25 or S21 can be chosen when placing your order. The light signals are transmitted to the optical receiver via a fibre optical cable. The receiver transforms them into digital electric signals. These can be visualised with an oscilloscope or can be used to control other devices.

The system is suitable for signal monitoring from an anechoic chamber, a shielded RF chamber, or in an EMC test lab. Hard- and software can be EMC-optimized.

**OSE 450 set**

Optical Fibre Probe 4-Channel, 50 Mbps

**OE 450 Optical Receiver:**

Transmission range: DC ... 50 Mbps

Optical Input: Optical fibre: 4 x 2.2 mm Ø

Optical fibre connector: Ø 2.2 mm

Supply voltage: 12 V / 100 mA

Connector - input: 4 x BNC-Stecker, 5 V HCMOS

**S25 Optical Sensor:**

Transmission range: DC ... 50 Mbps

Optical fibre connector: Ø 2.2 mm

Supply voltage: 3 V ... 5 V

Current input: 30 mA

- 1x OE 450 (Optical Receiver)
- 4x S25 (Optical Sensor (50 Mbps))
- 4x LWL Ø 2.2 mm 6 m (Optical Fibre, Single 6 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x OSE 450 case (System Case)
- 1x OSE 450 qq (Quick Guide)
- 1x OSE 450 acc (Accessories)
- 1x Digital m (OSE User Manual)

The OSE 450 set is used to transmit digital signals from a disturbed device under test. It consists of four single sensors which are used to detect four digital signals inside the device under test and is connected to the oscilloscope via four fibre optical cables and one receiver.

Within the device under test, the sensor transforms measured logical signals into optical signals.

The optical signals are transmitted to the optical receiver via a fibre optical cable. These can be visualised with an oscilloscope or can be used for controlling other devices.

The system is suitable for signal monitoring from an anechoic chamber, a shielded RF chamber, or in an EMC test lab. Hard- and software can be EMC-optimized.







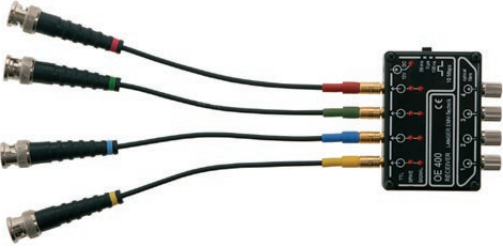

**OPTO**

**Optical test and measuring devices**

15.40 Optical fibre probe (digital) sensors and receivers

**digital**

**Technical data: optical fibre probe - digital**

Optical sensors:	for OSE 450 set	for OSE 150 set and OSE 450 set
The optical sensors converts digital signals into light signals (Optical fibre connection - Ø 2.2 mm)	 <b>S21 sensor (34x10x6) mm</b>	 <b>S25 sensor (34x10x6) mm</b>
Transmission range	DC ... 10 Mbps	DC ... 50 Mbps
Current input	10 mA	30 mA
Reference IC type	HC - integral	VHC / AHC integral
Supply voltage	3 - 5 V	3 - 5 V
Optical receivers	for OSE 450 set	for OSE 150 set
The optical receivers converts digital light signals into electric signals (Optical fibre connection - Ø 2.2 mm)	 <b>OE 450 receiver (74x67x20) mm</b>	 <b>OE 150 receiver (71 x 47 x 14) mm</b>
Transmission rate	DC ... 50 Mbps	DC ... 50 Mbps
Current input	< 100 mA	< 80 mA
Output	4 x BNC-plug, 5 V HCMOS	BNC-plug, 5 V HCMOS
Power supply	12 V via external power supply	
Use with:	<ul style="list-style-type: none"> <li>• Sensors of the types S21 and S25 for transmitting signals via optical fibre</li> <li>• Burst detectors of the types BD01B, BD01E and BD06B for detecting burst events.</li> </ul>	<ul style="list-style-type: none"> <li>• its transmission rate makes it ideal for sensors of the type S25</li> </ul>

**A100-1 set**

Optical Fibre Probe 1-channel, 25 kHz

**Bandwidth:** DC ... 25 kHz**Sampling rate:** 125 kbps**Resolution:** 12 Bit**Optical fibre length:** 1 m ... 20 m

- 1x AE 100 (Optical Receiver)
- 1x AS 100 (Optical Sensor (50 / 10) V DC)
- 1x LWL Ø 2.2 mm 1.5 m (Optical Fibre Single 1.5 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A100-1 acc (Accessories)
- 1x A100-1 case (System Case)
- 1x Analog m (User Manual)

The A100-1 set is used for oscillating analog signals under EFT/ESD/RF interference. The set is particularly suitable for the measurement of analog signals when testing the immunity of electrical or electronic devices (equipment) against high-frequency electromagnetic fields (IEC 61000-4-3 to IEC 61000-4-6). This system is suitable for signal control in an anechoic chamber or EMC-compliant space.

The set consists of a sensor which measures an analog signal within the device under test and transforms it into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which then transforms them into electrical signals. Those can be seen with an oscilloscope or can be used for controlling other devices.

For signal detecting within the device under test several sensor types AS100, AS110 or AS120 with different measuring ranges are available.

**A100-2 set**

Optical Fibre Probe 2-Channel, 25 kHz

**Bandwidth:** DC ... 25 kHz**Sampling rate:** 125 kpsps**Resolution:** 12 Bit**Optical fibre length:** 1 m ... 20 m

- 2x AE 100 (Optical Receiver)
- 2x AS 100 (Optical Sensor (50 / 10) V DC)
- 2x LWL Ø 2.2 mm 6 m (Optical Fibre, Single 6 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A100-2 acc (Accessories)
- 1x A100-2 case (System Case)
- 1x Analog m (User Manual)

The A100-2 set is used for oscillographing analog signals under EFT/ESD/RF interference. The set is particularly suitable for the measurement of analog signals when testing the immunity of electrical or electronic devices (equipment) against high frequency electromagnetic fields (IEC 61000-4-3 to IEC 61000-4-6). This system is suitable for signal control in an anechoic chamber or EMC-compliant space. The set consists of two sensors which measure an analog signal within the device under test and transform it into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which then transforms them into electrical signals. Those can be seen with an oscilloscope or can be used for controlling other devices.

For signal detecting within the device under test several sensor types AS100, AS110 or AS120 with different measuring ranges are available.

**A200-1 set**

Optical Fibre Probe 1-channel, 500 kHz

**Bandwidth:** DC ... 500 kHz**Sampling rate:** 3 Msps**Resolution:** 12 Bit**Optical fibre length:** 1 m ... 20 m

- 1x AE 200 (Optical Receiver)
- 1x AS 200 (Optical Sensor (50 / 10) V DC)
- 1x LWL Ø 2.2 mm 1.5 m (Optical Fibre Single 1.5 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A200-1 acc (Accessories)
- 1x A200-1 case (System Case)
- 1x Analog m (User Manual)

The A200-1 set consists of a sensor, which allows for oscilloscopically displaying analog signals under EFT/ESD/RF interference potential free. Disturbed signals can be easily detected. In the device under test the sensor transforms the measured analog signals into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which transforms them into electrical signals. These can be seen with an oscilloscope or can be used for controlling other devices. The system is suitable for monitoring a device under test in an anechoic chamber or for EMC optimizing of hard- and software.

**A200-2 set**

Optical Fibre Probe 2-Channel, 500 kHz

**Bandwidth:** DC ... 500 kHz**Sampling rate:** 3 Msps**Resolution:** 12 Bit**Optical fibre length:** 1 m ... 20 m

- 2x AE 200 (Optical Receiver)
- 2x AS 200 (Optical Sensor (50 / 10) V DC)
- 2x LWL Ø 2.2 mm 6 m (Optical Fibre, Single 6 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A200-2 acc (Accessories)
- 1x A200-2 case (System Case)
- 1x Analog m (User Manual)

The A200-2 set consists of two sensors which allow for potential free transmission of analog signals under EFT/ESD/RF interference. The signals are displayed on an oscilloscope. Disturbed signals can be easily detected. In the device under test the sensor transforms the measured logic signals into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which transforms them into electrical signals. These can be seen with an oscilloscope or can be used for controlling other devices. The system is suitable for monitoring signals or devices under test in an anechoic chamber or for EMC optimizing of hard- and software.

**A300-1 set**

Optical Fibre Probe 1-channel, 5 MHz

**Bandwidth:** DC ... 5 MHz**Sampling rate:** 12.5 Msps**Resolution:** 10 Bit**Optical fibre length:** 1 ... 20 m

- 1x AE 300 (Optical Receiver)
- 1x AS 300 (Optical Sensor, Analog  $\pm 10$  V DC)
- 1x LWL  $\varnothing$  2.2 mm 1.5 m (Optical Fibre Single 1.5 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A300-1 acc (Accessories)
- 1x A300-1 case (System Case)
- 1x Analog m (User Manual)

The A300-1 set consists of a sensor, which allows for oscilloscopically displaying analog signals under EFT/ESD/RF interference potential free. Disturbed signals can be easily detected. In the device under test the sensor transforms the measured analog signals into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which transforms them into electrical signals. These can be presented with an oscilloscope or can be used for controlling other devices. The system is suitable for monitoring a device under test in an anechoic chamber or for EMC optimizing of hard-and software. For signal detecting within the device under test several sensor types AS 300 or AS 350 with different measuring ranges are available.

**A300-2 set**

Optical Fibre Probe 2-Channel, 5 MHz










**Bandwidth:** DC ... 5 MHz**Sampling rate:** 12.5 Msps**Resolution:** 10 Bit**Optical fibre length:** 1 m ... 20 m

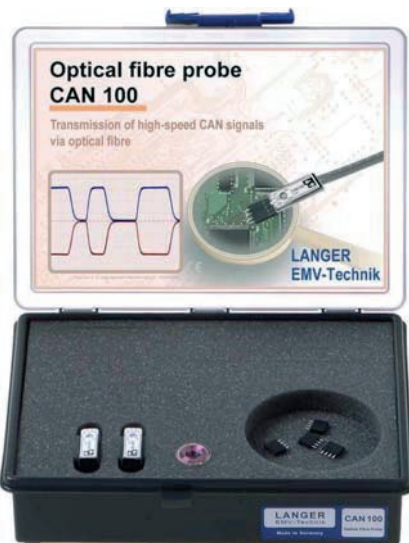
- 2x AE 300 (Optical Receiver)
- 2x AS 300 (Optical Sensor, Analog  $\pm 10$  V DC)
- 2x LWL  $\varnothing$  2.2 mm 6 m (Optical Fibre, Single 6 m)
- 1x NT FRI EU (Power Supply Unit)
- 1x A300-2 acc (Accessories)
- 1x A300-2 case (System Case)
- 1x Analog m (User Manual)

The A300-2 set consists of two sensors, which allow for displaying oscilloscopically analog signals under EFT/ESD/RF interference potential free. Disturbed signals can be easily detected. In the device under test the sensor transforms the measured logic signals into optical signals. The optical signals are transmitted via a fibre optical cable to the optical receiver which transforms them into electrical signals. These can be presented with an oscilloscope or can be used for controlling other devices. The system is suitable for monitoring signals or devices under test in an anechoic chamber or for EMC optimizing of hard-and software. For signal detecting within the device under test several sensor types AS 300 or AS 350 with different measuring ranges are available.



**Technical data: Optical fibre probe - analog**

Optical sensors:	for A100 set			for A200 set	for A300 set	NEW
The sensors converts analog signals into light signals (Optical fibre connection - Ø 2.2 mm)	 <b>AS 100</b> (34x10x7) mm	 <b>AS 110</b> (34x10x7) mm	 <b>AS 120</b> (34x10x7) mm	 <b>AS 200</b> (34x10x7) mm	 <b>AS 300</b> (36x11x6) mm	 <b>AS 350</b> (36x11x6) mm
Measuring range (changeable)	50 V / 10 VDC	10 V / 1 VDC	1 V / 0.1 VAC	50 V / 10 VDC	±10 VDC	±50 VDC
Immunity to radiated emission	>200 V/m	>100 V/m	>100 V/m	>100 V/m	200 V/m	
Input resistance	100 kΩ	1 MΩ	1 MΩ	100 kΩ	100 kΩ	1 MΩ
Current input	≈ 3 mA			≈ 30 mA	70 mA (4.5 V) 30 mA (16 V)	
Supply voltage	3 - 16 V				4.5 - 16 V	
Optical receivers	for A100 set		for A200 set	for A300 set		
The receivers converts light signals into electric signals (Optical fibre connection - Ø 2.2 mm)	 <b>AE 100</b> (71x47x14) mm		 <b>AE 200</b> (71x47x14) mm	 <b>AE 300</b> (71x47x14) mm		
Current input	≈ 30 mA		≈ 100 mA	≈ 90 mA		
Voltage range - output	0 - 10 V				±1 V	
Supply voltage	12 -16 V				12 - 16 V	
Power supply	12 V via external power supply					
Sampling rate	125 kbps			3 Mbps	12.5 Mbps	
Bandwidth	Dc ... 25 kHz			DC ... 500 kHz	DC ... 5 MHz	
Resolution	12 Bit			12 Bit	10 Bit	

**CAN 100 set**

## Bus System

**CAN 100 Optical Fibre Probe:**

Transmission range: 0 ... 1 Mbit/s

Optical fibre connector: 2 x Ø 2.2 mm

CAN transceiver: SN65HVD251

Supply voltage: 5 V

Current input: max. 80 mA

Optical fibre length: max. 10 m (max. 6 m at 1 Mbit/s)

- 2x CAN 100 (Optical Fibre Probe)
- 1x LWL double 10 m (Optical Fibre, Double 10 m)
- 1x CAN 100 acc (Accessories)
- 1x A5 case (System case)
- 1x CAN 100 m (CAN 100 Set User Manual)

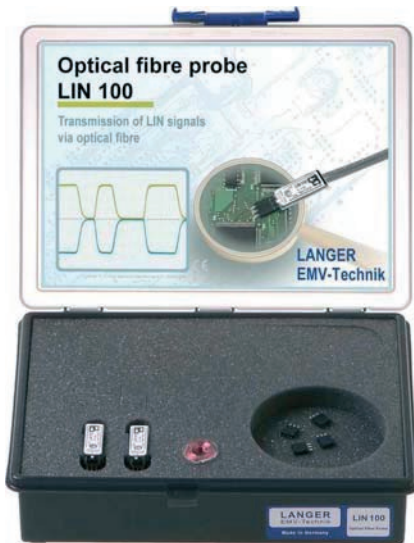
The CAN 100 set allows for the transmission of high speed CAN signals via optical fibre cables during EMC tests or when there are great potential differences (high voltage). The set consists of 2 small CAN probes. For connection to a control unit outside the shielded housing the A01 adapter is suitable.

**CAN 100 A01 set**

## Adapter for CAN 100

- 1x CAN 100 A01 (Adapter for CAN Sensors)
- 1x NT FRI EU (Power Supply Unit)

The adapter for CAN probes 12V allows the connection from the field bus system to a control unit, e.g. to a PC. The adapter connects the probe to a control unit and is powered by a wall plug transformer.



### LIN 100 set Bus System

#### LIN 100 Optical Fibre Probe:

Optical fibre connector: 2 x Ø 2.2 mm  
Radiated immunity: > 200 V/m  
Supply voltage (Master): 8 - 15 V (Master)  
Supply voltage (Slave): 8 - 30 V (Slave)  
Current input: max. 45 mA  
Max. optical fibre length: 20 m

- 2x LIN 100 (Optical Fibre Probe)
- 1x LWL double 10 m (Optical Fibre, Double 10 m)
- 1x LIN 100 acc (Accessories)
- 1x A5 case (System case)
- 1x LIN 100 m (LIN 100 Set User Manual)

The LIN 100 set allows for a bidirectional, potential-free transmission of LIN signals via optical fibre cables during EMC tests or when there are great potential differences (high voltage). The set consists of 2 small LIN probes.

**BD Product family**  
Burst Detector Family**Optical fibre connector:** 2.2 mm Ø**Max. optical fibre length:** 20 m

- 1x BD 11 (H-Field Burst Detector)
- 1x BD 06B (H-Field Burst Detector)
- 1x BD 01B (H-Field Burst Detector)
- 1x BD 01E (E-Field Burst Detector)

The burst detector selectively detects conducted disturbance which would influence the monitored device. It can be connected to a cable bundle and can monitor the supply lines of an electronic device. If the interference threshold is exceeded, the burst detector sends a light signal via an LED and an optical output. An optical receiver (OE 150) can transform this light signal into an electrical signal, which can be used for different analyses (e.g. for recording or emergency stop of the controlled system).

The BD 11 burst detector is designed for the detection of a burst- or ESD current pulse within a cable. The BD 11 is very sensitive, battery-operated and has memory to store the recorded signal.

The BD 01B and BD 06B burst detectors detect the magnetic field of a Burst- or ESD current pulse. The detectors are highly sensitive allowing for stepless variability.

The BD 01E burst detector detects a burst- or ESD voltage pulse's electric field. The detector is highly sensitive, which allows for stepless variability.





**Quality features of the near-field probes from Langer EMV-Technik GmbH**

Two factors are crucial for the quality assessment of near field probes:

**1. A constant sensitivity over a wide range of frequencies**

A probe's constant sensitivity ensures the correct representation of the frequency spectrum of the magnetic field emitted by the device under test. Points of resonance and other irregularities in the frequency curve falsify the measurement results and mislead the developer. A near-field probe must have a consistent, almost constant frequency response. Therefore this allows the developer to focalize EMC implementations for the device under test.

**2. An enhanced ability to suppress electric fields (magnetic field probes)**

The near-field probes must allow the clear and separate measurement of a module's electric fields (which are generated by switching transistors in the power supply unit, for example) and magnetic fields (which are caused by currents in blocking capacitors, for example). For practical measurements, this means that magnetic field probes may not detect any electric fields. The magnetic field probe design allows the suppression of electric field influences (E-field suppression). The quality of E-field suppression is crucial when selecting a magnetic field probe.

**The following criteria are important for selecting the optimum near-field probe:**

- clear distinction between magnetic and electric near fields
- selection of the suitable probe heads according to the field intensities and field structures to be measured
- wide useful frequency range
- easy handling for the developer



**Near field probes type MFA aktiv**  
Frequency range  
1 GHz to 6 GHz



**Near field probes Typ SX**  
Frequency range  
1 GHz to 10 GHz



**Near field probes Typ XF / XFS (Mover)**  
Frequency range  
30 MHz to 6 GHz



**Near field probes Typ RF / RFS (Mover)**  
Frequency range  
30 MHz to 3 GHz



**Near field probes type LF**  
Frequency range  
100 kHz to 50 MHz

**MFA 01 set**

Micro Probes 1 MHz up to 6 GHz

**Frequency range:** 1 MHz ... 6 GHz**Resolution:** 200 µm

- 1x MFA-R 0.2-6 (Micro Probe 100 MHz up to 6 GHz)
- 1x MFA-K 0.1-12 (Micro Probe 100 MHz up to 6 GHz)
- 1x MFA-R 0.2-75 (Micro Probe 1 MHz up to 1 GHz)
- 1x BT 706 (Bias Tee)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x NT FRI EU (Power Supply Unit)
- 1x MFA case (System Case Near-Field Probes)
- 1x MFA acc (Accessories)

The MFA 01 set includes high-resolution micro probes used to measure magnetic fields up to 6 GHz, e.g. at signal conductors (150µm), SMD components (0603-0201), or IC pins. Each hand-guided MFA micro probe has an integrated preamplifier.

The amplifier stage (9V, 100mA) is powered via the bias tee BT 706, which has an impedance of 50 Ohm. The micro probes are connected via the BT 706 to a spectrum analyzer or an oscilloscope.

Langer EMV-Technik GmbH includes correction lines in the delivery. With the help of the correction lines the probe's output voltage is converted into either the respective magnetic field or the current running through the conductor.

**MFA 02 set**

Micro Probes 1 MHz up to 1 GHz

**Frequency range:** 1 MHz ... 1 GHz**Resolution:** 200 µm

- 1x MFA-R 0.2-75 (Micro Probe 1 MHz up to 1 GHz)
- 1x MFA-K 0.1-30 (Micro Probe 1 MHz up to 1 GHz)
- 1x BT 706 (Bias Tee)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x NT FRI EU (Power Supply Unit)
- 1x MFA acc (Accessories)
- 1x MFA case (System Case Near-Field Probes)

The MFA 02 set includes two high-resolution micro probes used to measure low-frequency magnetic fields up to 1 GHz, e.g. at signal conductors (150µm), SMD components (0603-0201) or IC pins. Each hand-guided MFA micro probe has an integrated preamplifier.

The amplifier stage (9V, 100mA) is powered via the bias tee BT 706, which has an impedance of 50 Ohm. The micro probes are connected via the BT 706 to a spectrum analyzer or an oscilloscope.

Langer EMV-Technik GmbH includes correction lines in the delivery. With the help of the correction lines the probe's output voltage is converted into either the respective magnetic field or the current running through the conductor.

**SX1 set**

Near-Field Probes 1 GHz up to 10 GHz

**Frequency range:** 1 GHz - 10 GHz**Connector:** SMA, female, jack**Weight:** 200 g

- 1x SX-E 03 (E-Field Probe 1 GHz up to 10 GHz)
- 1x SX-B 3-1 (H-Field Probe 1 GHz up to 10 GHz)
- 1x SX-R 3-1 (H-Field Probe 1 GHz up to 10 GHz)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x Case 4 (System Case Near-Field Probes)

The SX1 set consists of three passive near-field probes for measuring E-fields and magnetic fields with a high clock frequency from 1 GHz to 10 GHz on electronic assemblies and ICs during the development stage. The different probe heads of the SX1 set allow for measurements very close to the electronic assemblies, e.g. on single IC pins, conducting paths, components, and connectors, in order to localize interference sources. An electronic assembly's field orientation and field distribution can be detected through specific use of the near-field probe. The near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do have an internal terminating resistance.

**XF1 set**

Near-Field Probes 30 MHz up to 6 GHz

**Frequency range:** 30 MHz ... 6 GHz**Output resistance:** 50  $\Omega$ 

- 1x XF-B 3-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-E 10 (E-Field Probe 30 MHz up to 6 GHz)
- 1x XF-R 3-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-R 400-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-U 2.5-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x Case 5 (System Case Near-Field Probes)

The XF1 set consists of four magnetic field probes and one E-field probe for measuring E-fields and magnetic fields from 30 MHz to 6 GHz on electronic assemblies during the development stage. Due to their integrated impedance matching, the probes are less sensitive in the lower frequency range than the RF-type probes. The probe heads of the XF1 set allow for the step by step localization of magnetic-field interference sources on assemblies. First the XF-R 400-1 probe is used to detect electromagnetic interference from greater distances. Next, the higher resolution probes can be used to more precisely detect the interference sources. The E-field probe is used for the detection of electric interference fields near the assemblies. With trained use of the near-field probes, field orientation and field distribution can be detected. The near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They have an internal terminating resistance.





### XF Product family

Near-Field Probes 30 MHz up to 6 GHz

- 1x XF-E 04s (E-Field Probe 30 MHz up to 6 GHz)
- 1x XF-E 09s (E-Field Probe 30 MHz up to 6 GHz)
- 1x XF-E 10 (E-Field Probe 30 MHz up to 6 GHz)
- 1x XF-R 3-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-R 100-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-R 400-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-U 2.5-1 (H-Field Probe 30 MHz up to 6 GHz)
- 1x XF-B 3-1 (H-Field Probe 30 MHz up to 6 GHz)

The XF family consists of 5 passive magnetic field probes and 4 passive E field probes designed for measuring magnetic and E-fields in ranges from 30 MHz to 6 GHz during the development phase. Due to their integrated impedance matching the probes are less sensitive in the lower frequency range than the RF type probes. With its broad frequency spectrum and large to very small probe heads, the set covers a wide range of application. An individual probe set can be compiled according to any individual customer's need. The probe heads of the XF family allow for the step by step identification of interference sources on an assembly. We recommend firstly, detecting interference sources on assemblies with the larger sensitive probes from a greater distance. Next, using higher resolution probes, the interference sources can be more precisely located. With trained use of the near field probes field orientation and field distribution on the electronic assembly can be detected. The near field probes are small and handy. They have a sheath current attenuation and are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They have an internal terminating resistance.

**RF1 set**

Near-Field Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-K 7-4 (H-Field Probe 30 MHz up to 1 GHz)
- 1x RF-E 10 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 2.5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 4 (System Case Near-Field Probes)

The RF1 near-field probe set consists of four passive near-field probes for measuring E-fields and magnetic fields from 30 MHz to 3 GHz on electronic assemblies during the development stage. The different probe heads of the RF1 set allow for measurements very close to the electronic assemblies, e.g. on single IC pins, conducting paths, components, and connectors, in order to localize interference sources. An electronic assembly's field orientation and field distribution can be detected through specific use of the near-field probe. The near field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

**RF2 set**

Near-Field Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-R 400-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 50-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-B 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 4+ (System Case Near-Field Probes)

The RF2 near-field probe set consists of four passive near-field probes for measuring E-fields and magnetic fields from 30 MHz to 3 GHz on electronic assemblies during the development stage. The probe heads of the RF2 set allow for the step by step localization of RF magnetic-field interference sources on assemblies. The RF-R 400-1 and RF-R 50-1 probes can detect electromagnetic interference from greater distances. With their higher resolution, the RF-B 3-2 and RF-U 5-2 probes are designed to detect the interference sources more precisely. An electronic assembly's field orientation and field distribution can be detected through specific use of the near-field probe. The near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

**RF3 mini set**

Near-Field Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-B 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x RF-R 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 4 (System Case Near-Field Probes)

The RF3 mini set consists of two passive near-field probes with a resolution under 1 millimeter for measuring magnetic fields between 30 MHz and 3 GHz on electronic assemblies during the development stage.

The probes have special miniature heads which are designed for detailed measurements of magnetic field and disturbance currents in the layout and component range. Field orientation and field distribution on an electronic assembly can be detected by special guidance of the near field probe.

The near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. The near-field probes can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

We recommend using the passive probes with a 20 dB or 30 dB pre-amplifier.

**RF4-E set**

Near-Field Probes E-field 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-E 02 (E-Field Probe 30 MHz up to 1.5 GHz)
- 1x RF-E 05 (E-Field Probe 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 2 (System Case)

The RF4-E probe set contains two passive E field probes to measure electrical fields with a frequency range from 30 MHz up to 3 GHz for comparison purposes.

The probes are designed for the analysis of E field distributions, detection of coupling mechanisms on modules and evaluation of switching edges on signal leads and RF voltages of the supply system.

The near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. The near-field probes can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

**RF5 set**

Near-Field Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-R 400-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 2.5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 05 (E-Field Probe 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 4+ (System Case Near-Field Probes)

The RF5 near-field probe set consists of three passive magnetic-field probes and one passive E-field probe for measuring E-fields and magnetic fields from 30 MHz to 3 GHz on electronic assemblies during the development stage. The probe heads of the set RF5 allow for the step by step localization of the RF-magnetic-field and RF-E-field interference sources on an assembly. The RF-R 400-1 probe can detect electromagnetic interference from greater distances. With their higher resolution, the RF-R 3-2 and RF-U 2,5-2 probes are designed to detect the interference sources more precisely. The RF-E 05 E-field probe is designed to detect E-field sources. An electronic assembly's field orientation and field distribution can be detected through specific use of the near-field probe. The near field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

**RF6 set**

Near-Field Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz**Connector:** SMB, male, jack

- 1x RF-R 50-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-B 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 02 (E-Field Probe 30 MHz up to 1.5 GHz)
- 1x RF-E 10 (E-Field Probe 30 MHz up to 3 GHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x HZ-15 Case (System Case Near-Field Probes)

The RF6 near field probe set consists of 2 passive magnetic field probes and 2 passive E field probes for measurements in the development phase of the E-field and magnetic field in the range from 30 MHz to 3 GHz on electronic assemblies. The probe heads of the RF6 set allow a step by step localization of interference sources of the RF magnetic field and RF-E-field on an assembly. From a larger distance the electromagnetic interference is detected by RF-R 50-1 for the magnetic field and by RF-E 02 for the E-field. The RF-B 3-2 and RF-E 10 probes with their higher resolution can more precisely detect the interference sources of the magnetic field and the E-field. Field orientation and field distribution on an electronic assembly can be detected by special guidance of the near field probe. The near field probes are small and handy. They have a sheath current attenuation and are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.





### RF Product family

Near-Field Probes 30 MHz up to 3 GHz

- 1x RF-E 02 (E-Field Probe 30 MHz up to 1.5 GHz)
- 1x RF-E 03 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 04 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 05 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 09 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 10 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-K 7-4 (H-Field Probe 30 MHz up to 1 GHz)
- 1x RF-B 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x RF-B 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x RF-R 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 50-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 400-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 2.5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 5-2 (H-Field Probe 30 MHz up to 3 GHz)

The RF family are passive field probes for measurements of the magnetic field in the development phase in the range from 30 MHz to 3 GHz. An individual probe set is compiled according to the customer's need. The probe heads of the RF family allow the step by step identification of interference sources on an assembly. We recommend initially the detection of interference sources on assemblies by using large sensitive probes from a larger distance. Next, using higher resolution probes, the interference sources can be more precisely detected. With trained use of the near field probes field orientation and field distribution on the electronic assembly can be detected. The near field probes are small and handy. They have a sheath current attenuation and are electrically shielded.

They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.

**LF1 set**

Near-Field Probes 100 kHz up to 50 MHz

**Frequency range:** 100 kHz ... 50 MHz**Connector:** SMB, male, jack

- 1x LF-B 3 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-R 400 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-U 2.5 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-U 5 (H-Field Probe 100 kHz up to 50 MHz)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x Case 4+ (System Case Near-Field Probes)

The LF1 near-field probe set consists of four shielded near-field probes for measuring emissions of longwave, medium wave, and shortwave frequencies on electronic devices during the development process. The probe heads of the LF1 set are designed for the incremental detection of electromagnetic interference sources at single pins, larger components, and on assemblies. First, the electromagnetic interference of the assembly is detected by the LF-R 400 probe from up to 10 cm. Probes with higher resolution like the LF-B 3, LF-U 5 and LF-U 2.5 are then used to more precisely detect any source of interference. Our near-field probes are small and handy. They have a current attenuating sheath and, therefore, are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. The H-field probes do not have an internal terminating resistance of 50  $\Omega$ .

**LF Product family**

Near-Field Probes 100 kHz up to 50 MHz

- 1x LF-B 3 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-K 7 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-R 3 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-R 50 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-R 400 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-U 2.5 (H-Field Probe 100 kHz up to 50 MHz)
- 1x LF-U 5 (H-Field Probe 100 kHz up to 50 MHz)

The LF near field probe family consists of 7 shielded near field probes for making measurements in the development phase of RF magnetic field in the long wave, medium wave and short wave range of electronic assemblies. The probes are arranged to suit the customer's need.

The probe heads of the LF family allow for the step by step localization of interference sources on assemblies. At first the large and more sensitive probes detect electromagnetic interference of assemblies from a greater distance. Subsequent probes of higher resolution locate interference sources more precisely. Field orientation and field distribution on an electronic assembly can be detected through trained use of the near field probe.

The near field probes are small and handy. They have a sheath current attenuation and are electrically shielded. They can be connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance.



### PA Product family Preamplifier

- x PA 203 BNC (Preamplifier 100 kHz to 3 GHz)
- x PA 303 BNC (Preamplifier 100 kHz to 3 GHz)
- x PA 203 SMA (Preamplifier 100 kHz to 3 GHz)
- x PA 303 SMA (Preamplifier 100 kHz up to 3 GHz)
- x PA 303 N (Preamplifier 100 kHz - 3 GHz)
- x PA 306 SMA (Preamplifier 100 kHz to 6 GHz)

The preamplifier is used to amplify measuring signals, for example, from near field probes or antennas.

PA 203: 20 dB

PA 303: 30 dB

PA 306: 30 dB

The preamplifiers are available with different connectors for different measuring devices (oscilloscope or spectrum analyzer): BNC-, SMA-connectors or N-connector.



### ESA1 set

#### Emission Development System

**Frequency range:** 100 kHz - 1 GHz

- 1x CS-ESA set (ChipScan-ESA Software / CD-ROM)
- 1x HFW 21 (RF Current Transformer)
- 1x HFA 21 (RF Bypass)
- 1x Z23-1 set (Shielding Tent (900 x 500x 400) mm)
- 1x PA 203 BNC (Preamplifier 100 kHz to 3 GHz)
- 1x RF-B 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x RF-B 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 02 (E-Field Probe 30 MHz up to 1.5 GHz)
- 1x RF-E 05 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-E 10 (E-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 0.3-3 (H-Field Probe mini 30 MHz up to 3 GHz)
- 1x RF-R 3-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 50-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-R 400-1 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 2.5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x RF-U 5-2 (H-Field Probe 30 MHz up to 3 GHz)
- 1x ESA1 acc (Accessories)
- 1x ESA1 case (System case)
- 1x ESA1 m (ESA1 Set User Manual)

The ESA1 is a system of EMC tools for measuring the interference of assemblies and devices. The CS-ESA software allows the developer to quickly and comprehensively suppress interference affecting the DUT. Interference measurements taken during the development stage with ESA1 are proportional to the results from far-field measurements or from measurements with artificial networks. With the ESA1 tools disturbance sources can be localized, effects can be detected, and EMC measures individually determined. The effects of improvements implemented by ESA1 are proportional to the results from far-field measurements. ESA1 is designed for use at the developer's working place.



### CS-ESA set

#### ChipScan-ESA Software / CD-ROM

#### System requirements:

- Operating system: Windows XP/Vista/7 (latest service packs)
- Monitor resolution: (1280 x 1024) px
- Interface: USB port for dongle
- HD space: 1 GB
- Periphery: CD drive for installation

#### Recommended system requirements:

- Processor: Intel Core i5 2 GHz
- Memory: 2 GB
- Graphics card: AMD Radeon 7750

- 1x CS-ESA (ChipScan-ESA Software, CD-ROM)
- 1x Dongle (Licence Dongle)

The ChipScan-ESA is a software designed to control a spectrum analyzer remotely. The measurement curves are saved and logged in the ChipScan-ESA. The user can then choose logged curves to combine with other logged curves, correction curves, frequency-dependant functions (curves), or constants into a single curve. Any limit value curves can be created or imported and displayed as csv data. Different curves can be quickly and systematically compared. The functions of the ChipScan-ESA software are valuable to the developer, particularly for spectrum-analyzer measurements taken during the development stage.



**HFW 21 set**

RF Current Transformer 100 kHz - 1 GHz

**Frequency range:** 100 kHz - 1 GHz**Weight:** 400 g

- 1x HFW 21 (RF Current Transformer)
- 1x HFA 21 (RF Bypass)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x HFW 21 acc (Accessories)
- 1x HFW 21 m (HFW 21 Set User Manual)
- 1x HFW 21 case (System Case)

The RF-current transformer measures high-frequency currents at the DUT's lines. For reproducible measurements a metallic ground plane is needed as a reference plane. The small-scale measurement set-up at the developer's workspace allows for fast analysis of EMC measuring effects.

**NNB 21 set**

Line Impedance Stabilisation Network

**Frequency range:** 100 kHz - 1 GHz**Measuring channels:** 2**Continuous power rating:****Weight:** 400 g

- 1x NNB 21 (Line Impedance Stabilisation Network)
- 1x SMB-BNC 1 m (SMB-BNC Measurement Cable)
- 1x NNB 21 acc (Accessories)
- 1x NNB 21 case (System Case)
- 1x NNB 21 m (NNB 21 Set User Manual)

The NNB 21 line impedance stabilisation network is designed for measuring of grid bound interferences of a device under test according to the standard CISPR 25/ISO 7637.

It measures the RF interference, which couples into the vehicle electrical system. Measurements during the development in a frequency range from 100 kHz to 1GHz can be carried out.

**Z23-1 set**

Shielding Tent (900 x 500x 400) mm

**Attenuated shielding:** 45 dB - 50 dB / 30 MHz - 1 GHz**Weight:** 12 kg**Sizes (L x W x H):** (900 x 500 x 400) mm

- 1x GP 23 (Ground Plate)
- 1x BZ 23-1 (Shielding Material)
- 1x ZG 23-1 (Tent Poles)

The Z23-1 shielding tent consists of a frame with a shielding cover and the GP 23 ground plate. It allows for shielding of the measurement set-up against external RF fields or for shielding the measuring devices, e.g. during ESD tests. From the front, the tent can be easily and quickly opened or closed making access to the device under test or the measuring device always possible. The shielding tent can be folded to the back for even better access to the device under test.

**Z23-2 set**

Shielding Tent (900 x 500 x 650) mm

**Attenuated shielding:** 45 dB - 50 dB / 30 MHz - 1 GHz**Weight:** 12 kg**Sizes (L x W x H):** (900 x 500 x 650) mm

- 1x GP 23 (Ground Plate)
- 1x BZ 23-2 (Shielding Material)
- 1x ZG 23-1 (Tent Poles)
- 1x ZGA 23-2 (Tent Poles Adapter)

The Z23-2 shielding tent has a higher working space than the Z23-1 shielding tent. Therefore, larger devices under test or measuring devices can be used inside the tent. It allows for shielding of the measurement set-up against external RF fields or for shielding the measuring devices, e.g. during ESD tests. From the front, the tent can be easily and quickly opened or closed making access to the device under test or the measuring device always possible. The shielding tent can be folded to the back for even better access to the device under test.

**D10 set**  
EMC Demonstration Board

- 1x D10 (Demonstration Board)

The D10 set is designed for demonstrations of products developed by Langer EMV-Technik GmbH. It is used for further training of distributors.

The demonstration board is a PC board with different components. These generate high frequent fields which can be used to demonstrate the function of near field probes developed by Langer EMV-Technik GmbH. The interference effect of generators and field sources developed by Langer EMV-Technik GmbH can also be demonstrated.



**FLS 106 PCB set**  
PCB Scanner, 3-Axis Positioning System

**x, y, z axes:**

Max. traverse distance: (400 x 600 x 125) mm  
Min. positioning distance: (20 x 20 x 20)  $\mu$ m  
Positioning speed: (50 x 50 x 25) mm/s

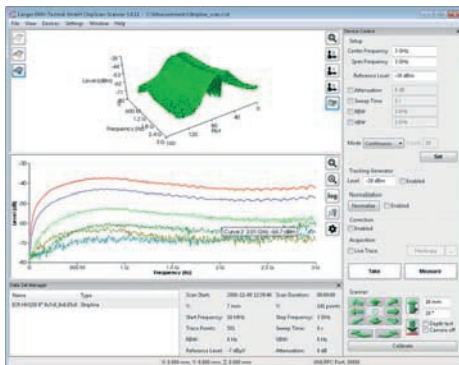
- 1x FLS 106 PCB (3-Axis Positioning System)
- 1x CS-Scanner (ChipScan-Scanner Software / CD-ROM)
- 1x UH DUT (Universal Holder)
- 1x SH 01 (Probe Holder)
- 1x DM-CAM (Digital Microscope Camera)
- 1x FLS 106 PCB acc (Accessories)
- 1x FLS 106 m (FLS 106 Set User Manual)

The FLS 106 PCB Langer scanner is a 3-axes positioning system used in conjunction with near-field probes in order to measure magnetic or E-fields up to 10 GHz and to pulse the device under test via field sources with pulse fields up to 200 mT.

The near-field probes or field sources can be moved along all three axes above the assembly.

A digital microscope camera allows for optical positioning control above the object being measured.

The included collision protection system stops the vertical movement of the probe if it touches the device under test.



**CS-Scanner**  
ChipScan-Scanner Software / CD-ROM

**System requirements:**

Operating system: Windows 7 64-bit (latest service packs)  
Periphery: CD drive for installation

ChipScan-Scanner is an evaluation software designed for reliable acquisition, fast interactive visualization and sophisticated analysis of electromagnetic compatibility (EMC) measurements of components. In combination with a Langer IC-Scanner and one of Langer's ICR microprobes, ChipScan-Scanner is a versatile tool for measuring high-frequency magnetic or electric fields up to 6 GHz of integrated circuits, PCBs and even complete products.



## PCB measurement radiated emission

27.00 Scanner field probe RFS set

RFS



### RFS set

Scanner Probes 30 MHz up to 3 GHz

**Frequency range:** 30 MHz ... 3 GHz

**Connector:** SMA, male, jack

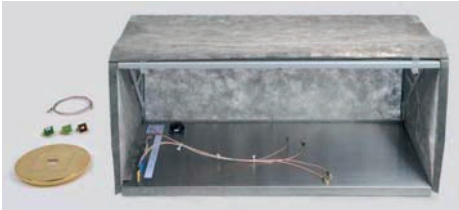
- 1x RFS-B 3-2 (Scanner Probe 30 MHz up to 3 GHz)
- 1x RFS-E 03 (Scanner Probe 30 MHz up to 3 GHz)
- 1x RFS-R 50-1 (Scanner Probe 30 MHz up to 3 GHz)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x RFS case (System Case Scanner Probes 30 MHz up to 3 GHz)

The RFS set consists of three passive near field probes designed for the use in a measurement scanner during the development of E-field and magnetic field.

They are designed for frequency ranges of 30 MHz to 3 GHz. The probe heads of the RFS set allow for close measurements needed to correctly localize interference sources on an electronic assembly. They document the whole image of the device under test's near field.

The scanner probes have a sheath current attenuation and are electrically shielded. They are connected to a spectrum analyzer or an oscilloscope with a 50  $\Omega$  input. They do not have an internal terminating resistance. The measuring signal can be increased with PA 203 or PA 303 preamplifier. On request further LFS, RFS, XFS, and SXS scanner probes are available.





### MP ESD Field set

Measurement of ESD Generator Fields

**Frequency range:** 1 GHz

- 1x BPM 02 (Field Measurement System)
- 1x EPM 02 (dE/dt Field Sensor)
- 1x EFM 04 (E-Field Meter/Counter)
- 1x GND 25 (Ground Plane)
- 1x GNDA 02 (Ground Adapter 32.9 mm x 32.9 mm)
- 1x ZG 23-1 (Tent Poles)
- 1x BZ 23-1 (Shielding Material)
- 1x GP 23 (Ground Plate)
- 1x MP ESD acc (Accessories)
- 1x MP ESD field case (System Case)
- 1x MP ESD Field m (MP ESD Field Set User Manual)

The MP ESD measuring field set is used to measure electric and magnetic fields of an ESD generator. In addition to the testing pulse, the ESD generators also emit electric and magnetic interference fields. Additionally to the test pulse these interference fields influence the device under test. These undefined influences falsify the ESD testing result.

With the MP ESD measuring field set at the working place, the developer can measure the additional ESD generator fields while changing the ESD generator position to the field measuring system.

The knowledge about intensity and local distribution of electric and magnetic interference fields of the ESD generator is an essential help for the interference suppression. On request, the MP ESD measuring field set is available with a taller working space (900 x 500 x 650) mm.



### MP ESD Generator Calibration set

Measurement of the Discharge Current Waveform

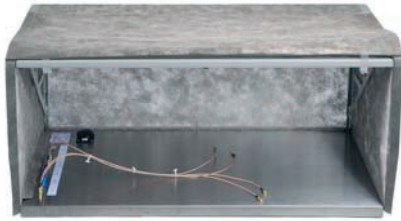
**Frequency range:** 1 GHz

- 1x SM 02-01 SMA (Shunt)
- 1x GNDA 02 (Ground Adapter 32.9 mm x 32.9 mm)
- 1x GND 25 (Ground Plane)
- 1x GP 23 (Ground Plate)
- 1x BZ 23-1 (Shielding Material)
- 1x ZG 23-1 (Tent Poles)
- 1x MP ESD acc (Accessories)
- 1x MP ESD calibration case (System Case)
- 1x MP ESD calibration m (MP ESD Calibration Set User Manual)

The MP ESD generator calibration set measuring station measures the curve shape of an ESD generator discharge current. Furthermore, transient processes in the discharge current curve shape can be measured and visualized in the frequency range up to 3 GHz. During testings, these transient processes have influence on the testing results. The scattering between different types of ESD generators can be traced back (among others) to this phenomenon.

To achieve a reproducible testing result, the discharge current curve shape, which is generated by the ESD generator and defined by the IEC 61000-4-2, should be regularly checked.

The mobile measuring station fits on the developer's work place and can be easily installed and removed. On request, the MP ESD generator calibration set is available in a taller work space (900 x 500 x 650) mm.

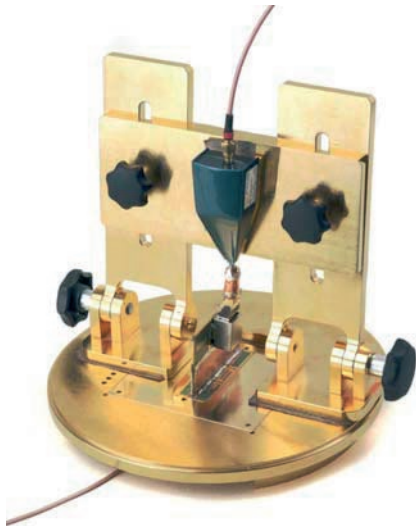
**MP Scope set**

EMC Measurement with an Oscilloscope

**Attenuated shielding:** 45 dB - 50 dB / 30 MHz - 1 GHz**Working surface (length x width):** (900 x 500) mm**Weight:** 13,5 kg**Sizes (L x W x H):** (900 x 500 x 400) mm

- 1x GP 23 (Ground Plate)
- 1x BZ 23-1 (Shielding Material)
- 1x ZG 23-1 (Tent Poles)
- 1x SMA-SMA rt 0.7 m ds (SMA-SMA Measurement Cable, red)
- 1x SMA-SMA ge 0.7 m ds (SMA-SMA Measurement Cable, yellow)
- 1x SMA-SMA gr 0.7 m ds (SMA-SMA Measurement Cable, green)
- 1x SMA-SMA bl 0.7 m ds (SMA-SMA Measurement Cable, blue)
- 1x MP Scope m (MP Scope Set User Manual)

The MP Scope measuring station is a mobile shielded room (shielded tent) for sensitive measuring devices during Burst-/EFT- or RF testings at the work place of a developer. The measuring device (oscilloscope, spectrum analyzer) is put into the shielded tent. The connection to the disturbed environment is maintained via shielded SMA-SMA cables and a shielded transit within the base plate. The measuring device is powered via the filter of the base plate. It is quite common to measure with devices like an oscilloscope or a spectrum analyzer at electronic assemblies. If the measurement should be done under disturbances, there is a risk that the measuring device could be susceptible to interference. In order to prevent the interference of the measuring device it is put into the shielding tent of the MP Scope measuring station. The signals of the electronic devices to be measured are transmitted via shielded connections to the MP Scope measuring station and measuring device.

**MP CI set**

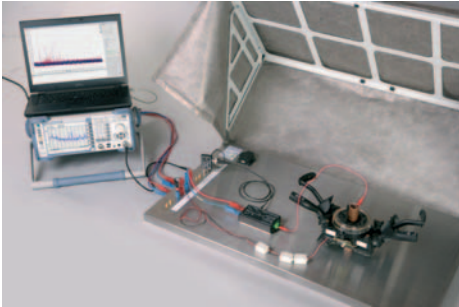
Coupling Inductance Measurement Station

- 1x P550 (Power Injection Probe)
- 1x GND 25 (Ground Plane)
- 1x GNDA 03 (Ground Adapter 22.9 mm x 68.3 mm)
- 1x KT 102 (Contact Table for Probe)
- 1x CS-CI (ChipScan Coupling Inductance Software)
- 1x Dongle (Licence Dongle)
- 1x SMA-SMA 1 m (SMA-SMA Measuring Cable)
- 1x SR SMB 10 cm (Semi-Rigid Coaxial Cable)
- 1x HCF (High Conductive Fleece)
- 1x MP CI case (System Case)
- 1x MP CI m (MP CI Set User Manual)

The MP CI set coupling inductance measurement station is used to determine EMC characteristics of connectors and cables. The coupling inductivity defines the coupling inductance of external disturbances on the shield or on the ground with the desired signals. If the coupling inductivity is considered in the construction set-up and the pin or wire assignment of connectors or cables, then the connectors or cables will be more interference-resistant.

The MP CI set can be used for following measurements at connectors or cables:

1. measurement of a single signal (common mode)
2. measurement of a symmetrical signal (common mode)
3. measurement of a symmetrical signal (differential mode)



### WS ESA1

Workshop for ESA1 development system emission

The Langer EMV-Technik GmbH offers a workshop for the use of ESA1 development system emission. During the workshop basic emission mechanisms are looked at, the setup of typical electronic devices are analyzed and options are derived to perform measurements during the development using ESA1. The ESA1 function is demonstrated with customer- owned circuit models or assemblies. Different modifications or EMC measures are immediately tested for their effects.

The aims for the workshop participants are:

- the understanding and optimal usage of the ESA1 development system
- the development of appropriate setups for own assemblies and the interpretation of test results



### WS Scanner

Workshops for PCB/IC Langer scanner

The Langer EMV-Technik GmbH offers a workshop for handling Langer-Scanner. Our development engineer explains the setup and the commissioning of a Langer-Scanner, the software installation and operation and a Scan demonstration.

Together with an engineer you perform a Test-Scan afterwards. Then you scan (with the help of an engineer) a DUT or (according to the arrangements) your own and learn how to analyze the Scan.

The aims of the workshop participants are:

- to get to know the PCB-Scanner and its handling
- to perform EMC-Scans at your DUTs



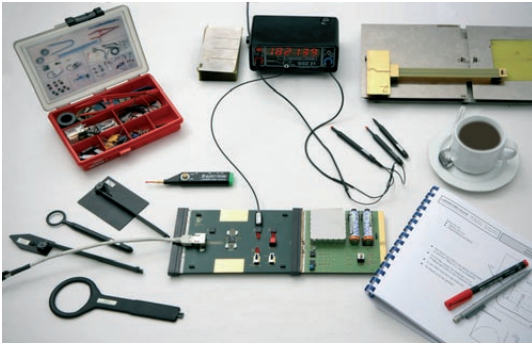
**EMV-B**  
EMC-Consulting / hour

The engineers of Gunther Langer`s engineering office suppress the interference of your assemblies. Therefore, they analyze them. The use of their measurement technology allows them to detect weak spots or sources of interference. When necessary they even analyze the smallest parts of your assembly, e.g. the circuit and the layout, to localize, for example, sensitive conducting paths and inputs.

We will be your competent partner if your development sample does not meet conformity requirements. We work analytically and can quickly detect the problem cause. Our EMC engineers modify the assemblies and test the effects on the spot.

It would be the best if our expertise is used before and during the development process of your first sample. So ideal start conditions save you development time.

The EMC consulting could be done either at Langer EMV GmbH or at your facilities.



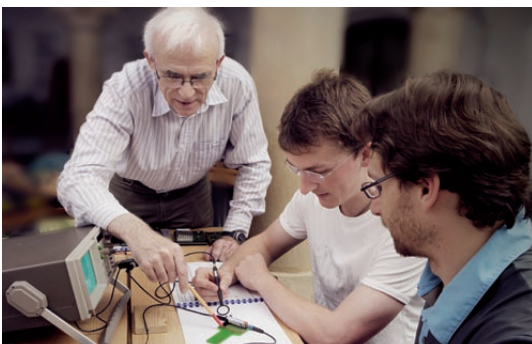
**SF1**  
**Experimental EMC Seminar - Interference Immunity 1**

Event location: Langer EMV-Technik GmbH  
Bannewitz near Dresden

Event duration: 2 days

In the Experimental EMC Seminar - Interference Immunity 1, participants will learn methods for analyzing and optimizing the EMC characteristics of circuits and devices. Additionally, participants will focus on detecting and eliminating the causes of interference-immunity problems during burst- or ESD testing.

With the help of numerous practical examples the participants learn the various steps of interference suppression using EMC measuring instruments. By carrying out a large number of guided experiments on their own, participants are able to test their learned knowledge and gain experience in dealing with measurement technology and troubleshooting techniques.



**SF2**  
**Experimental EMC Seminar - Interference Immunity 2**

Event location: Langer EMV-Technik GmbH  
Bannewitz near Dresden

Event duration: 1 day

The Experimental EMC Seminar - Interference Immunity part 2 is an advanced day-long workshop for those who have completed the basic seminar Interference Immunity part 1. The participants will focus on special EMC issues and their solutions, such as immunity interference at interfaces and the influence of ESD.

Each student will carry out a variety of hands-on experiments and will practice using interference measurement instruments to strengthen their understanding of interference immunity. By participating in the Experimental EMC Seminar - Interference Immunity part 2 you will have the knowledge to find solutions for immunity interference problems yourself.





**SA1**

**Experimental EMC Seminar - Emission 1**

Event location: Langer EMV-Technik GmbH  
Bannewitz near Dresden

Event duration: 2 days

Experimental EMC Seminar - Emission Part 1 is a basic seminar, in which you will learn methods for analyzing and optimizing EMC properties of circuits and devices. Participants use circuit models to analyze the relationship between near and far fields and develop strategies for assembly design and circuit sizing.

With the help of numerous practical examples the participants learn basic steps for suppressing components using suitable EMC measuring instruments. As a seminar participant, you will conduct a large number of experiments yourself. These experiments will cover all main topics and practically test your gained knowledge. Through this seminar your experience with near-field probes will grow exponentially.



**SA2**

**Experimental EMC Seminar - Emission 2**

Event location: Langer EMV-Technik GmbH  
Bannewitz near Dresden

Event duration: 1 day

The Experimental EMC Seminar - Emission part 2 is an advanced seminar for those who have completed the basic seminar Emissions part 1. In this seminar you will increase your understanding of EMC mechanics and how they impact emission. Participants reconstruct typical EMC measurement setups to determine the causes of emission and carry out development-stage measurements.

With the help of numerous practical examples the participants will practice using emission measurement instruments and strengthen their understanding of emission. By participating in the Experimental EMC Seminar - Emission part 2 you will have the knowledge to find solutions for noise emission problems yourself.



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