

EM Capacitor Probe Set

Quick Start Guide



What is in the box.....	3
What does it do.....	6
The 3D probe positioner	8
The low-noise amplifier.....	15
Verification of the setup.....	19
Technical specifications	21

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The information contained in this document is subject to change without notice.

This tool must be used according to the user guide. Any operation related to maintenance, repair or calibration must be carried out by qualified personnel. Consequently, in case of failure, contact Riscure to find out about the procedure to follow.

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What is in the box

The box contains the EM Capacitor Probe Set and all accessories to connect it to a computer and an oscilloscope.

Box content checklist

Qty [1]	Description		Identifier [2]
1			PROBE
1	Low-noise Amplifier, 50Ω, 100kHz to 2GHz, BNC connectors		LNA
1	Low-noise Amplifier power supply, 12V DC, 2.5 A (plug not mounted)		LNAPSU
1	Power supply plug adapter set		
2	Signal cable: - SMB to BNC, 50 Ω, coaxial, 3 ft		BNC2SMB

Qty [1]	Description		Identifier [2]
1	BNC T connector		BNCT
1	3D probe positioner: - Probe holding arm - Holding arm base		3DPOS
1	Cylinder probe holder		CYHOLD
1	3D probe positioner mount to EMPS Z-axis - With 2 M4 knurled knob		MNTZ
1	3D probe positioner mount to base plate for EMPS - with 2 M5 knurled knob		MNTBP
-	This "EM Capacitor Probe Set - Quick Start Guide"		

^[1] The amount or number of registered items (quantity, Qty)

^[2] Identifier used in this document to refer to the item.

What does it do

The EM Capacitor Probe Set contains a high sensitive EM capacitor probe to capture EM emission from capacitors attached to the target circuitry. It can pick up EM fields with frequencies from 30MHz up to 3 GHz and converts these into an analog signal.

The amplifier, which has flat bandwidth from 10MHz up to 2GHz, makes measurement with very small near field probes possible, while at the same time maintaining high sensitivity. It enables the probe to measure radio-frequency fields directly on capacitors or capacitor connections.

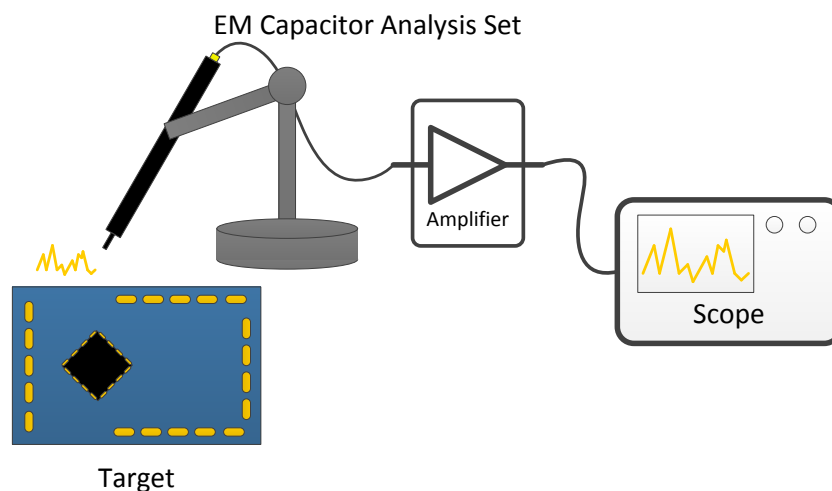


Figure 1 Functional overview of EM Capacitor Probe Set.

Since the EM signal quality from a target circuitry depends strongly on the placement of the EM probe. The user can make use of the 3D probe positioner is to help position the probe and acquire an optimal signal from the target circuitry.

The 3D positioner can be deployed stand-alone, as well as an attachment to the EM Probe Station 4.

For an EM emission scanning, the probe can be mounted to the Z-axis of EM Probe Station 4. Also, it can be mounted to the EM Probe Station 4 base plate, if a stationary positioning of the probe is desired.

The 3D probe positioner

Figure 2 depicts a fully assembled 3D probe positioner. It has 3 major components: a probe clamp (See *Figure 3*); a flex-arm, as shown in *Figure 4*; and finally a base plate for stabilizing the afore-mentioned 2 components.



Figure 2 The complete 3D probe positioner



Figure 3 The probe clamp

The EM capacitor probe can be held firmly by the hole in the middle of the clamp. Twisting the knob of the clamp in counter-clock wise direction increases the diameter of the probe mounting holes, while twisting the knob in clock wise direction decrease the diameter of the probe mounting holes.

The probe clamp can be screwed into any end of the flex-arm, while the other end of the flex-arm can be screwed into the base plate.



Figure 4 The flex-arm

The flex-arm has 3 movable joints, A, B and C. The knob next to the joint B controls all the 3 joints. To loosen the joints, twist the knob counter-clock wise. To tighten the joints, twist the knob clock wise.

Mount the flex-arm to EMPS Z-Axis

The flex-arm can be mounted to any EM Probe Station (Rev 3 or Rev 4). Mounting the arm can be done in 2 steps.



EM Probe Station 3 base plate does not have the mounting holes to mount the flex-arm.

First, mount the aluminum mounting piece to the Z-axis arm of the EM Probe Station (See *Figure 5*).

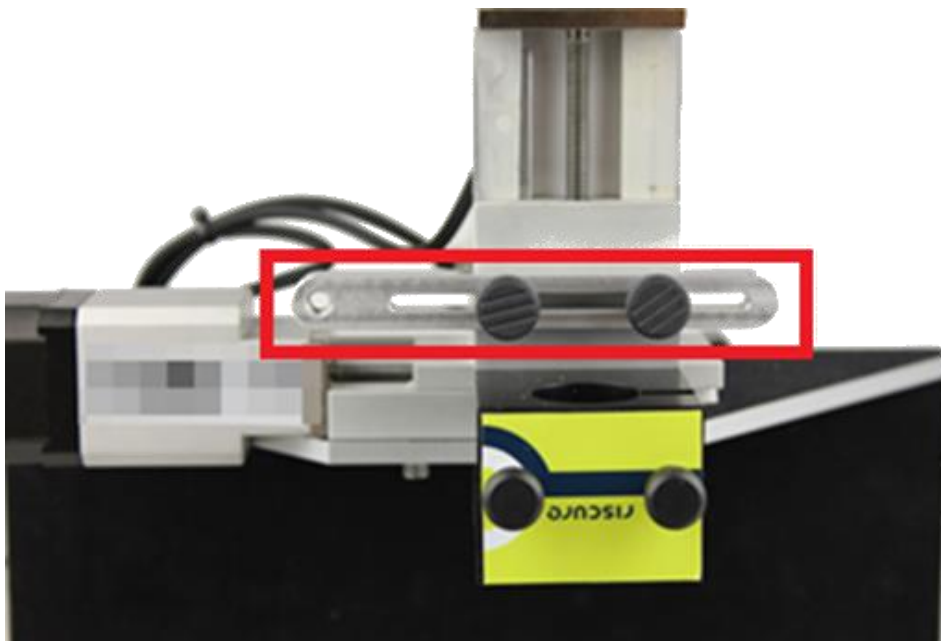


Figure 5 Aluminum mounting piece fixed by 2 x M4 knob screws

Then, the flex-arm can be screwed into the aluminum mounting piece.

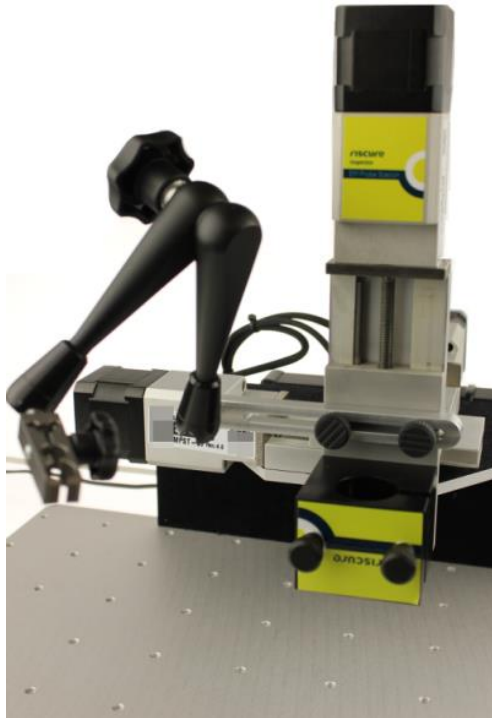


Figure 6 The flex-arm mounted to the aluminum part.

Mount the flex-arm to the EMPS 4 base plate

The flex-arm can also be mounted to the base plate of EM Probe Station 4. The arm can be mounted to the base plate in 2 steps.



EM Probe Station 3 base plate does not have the mounting holes to mount the flex-arm. The EM Probe Station 3 can be upgrade with the Modular Base Plate for EMPS

First, fix the plastic mounting piece to the base place with 2 M5 screws. (See *Figure 7*)



Figure 7 Plastic mounting piece fixed to the base plate with 2 x M5 screws. (Note that the mounting piece has reinforced connector to connect the flex-arm)

Then, the flex-arm can be screwed into the plastic mounting piece for further positioning.

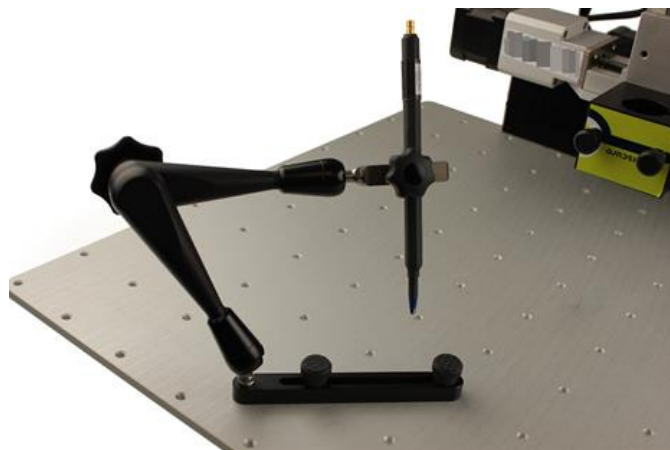


Figure 8 The flex-arm mounted to the plastic mounting piece

Mount the probe to the co-axial probe clamp of EMPS

The EM Capacitor Probe can also be mounted to the co-axial probe clamp of EMPS (Rev 3 and Rev 4). Due to the fact that the probe diameter is much smaller than that of the clamp, the cylinder adapter is needed to provide sufficient grip to the probe. The probe can be mounted into the co-axial clamp in 2 steps.

First, plug the cylinder adapter into the main clamp. (See *Figure 9*)

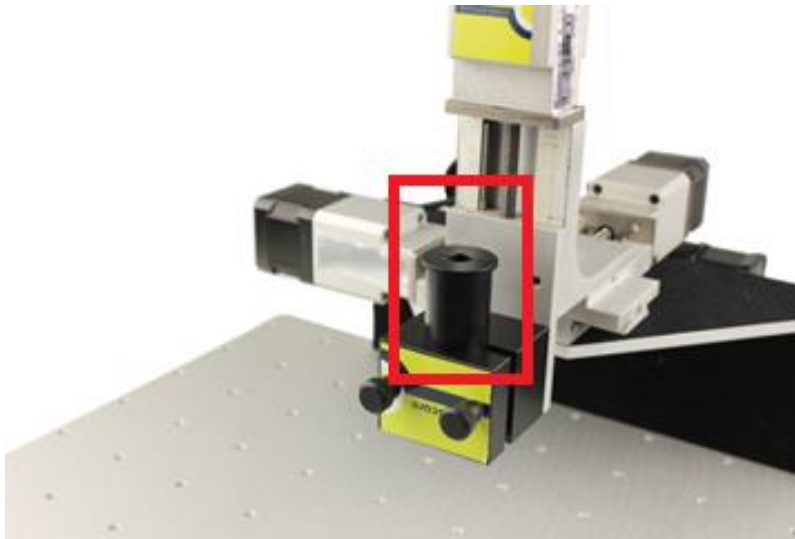


Figure 9 The cylinder adapter plugged into the main clamp

Then, plug the probe through the cylinder adapter. (See *Figure 10*)

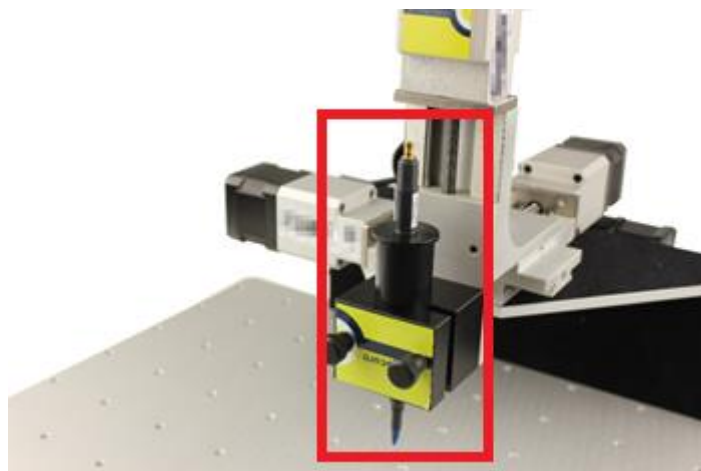


Figure 10 The probe plugged through the cylinder adapter



Finally, secure cylinder adapter with the main probe clamp of the EMPS. The screws on the main clamp can be used to further fix the probe. (See Figure 11)

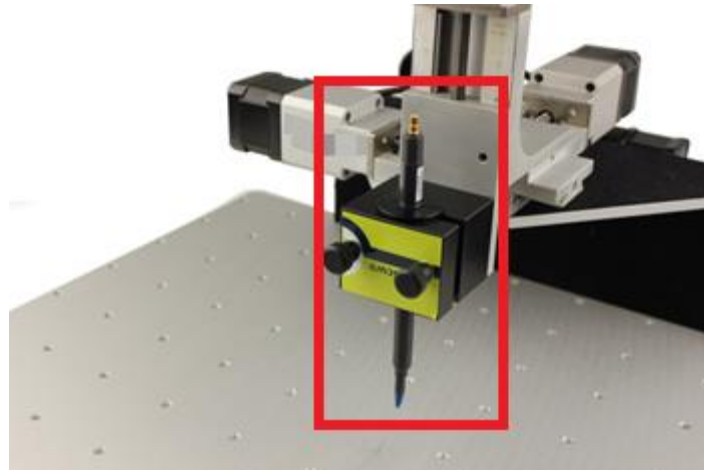


Figure 11 The probe and cylinder adapter in fully secured position

The low-noise amplifier

As shown in Figure 12, the low-noise amplifier connected to the EM Capacitor probe will magnify the signal to suitable amplitude for subsequent processing.

The amplifier has 3 ports: the input, the output and the 12 V DC socket. The input and output can be identified by looking at the signal flow graph printed on the amplifier casing.

The low-noise amplifier also features an LED indicator, which lights up when the amplifier is powered.

The input port should be connected to the signal source which will be amplified. While the output port should be connected to a downstream signal sink, such as: an icWaves.



The amplifier does not function without being connected to a 12V DC power supply.



Figure 12 The low-noise amplifier. Note that the input port should be connected to the EM capacitor probe output.

The power supply unit of the low-noise amplifier



Please note the power voltage should never exceed 25 volts DC!

Transient voltage above this can damage the amplifier.

The amplifier requires an external power supply to function. A 12 V DC power supply is shipped together with the amplifier.



Figure 13 Amplifier power supply unit. (Plug adapter not mounted)

The power supply has 4 exchangeable plug adapters.



Figure 14 Plug adapters to the power supply unit

To mount a plug adapter to the power supply unit, put the plug adapter on top of the reception socket of the power supply unit. Then slide it to toward the cable end of the power supply unit. Once the adapter is locked, a "click" noise can be heard.



Figure 15 put the plug adapter on top of the adapter receptacle.



Figure 16 slide the plug adapter to lock the adapter.

To remove a plug adapter from the power supply unit, press and hold the button next to the plug adapter. Slide the plug adapter away from the button to detach the plug adapter from the power supply.

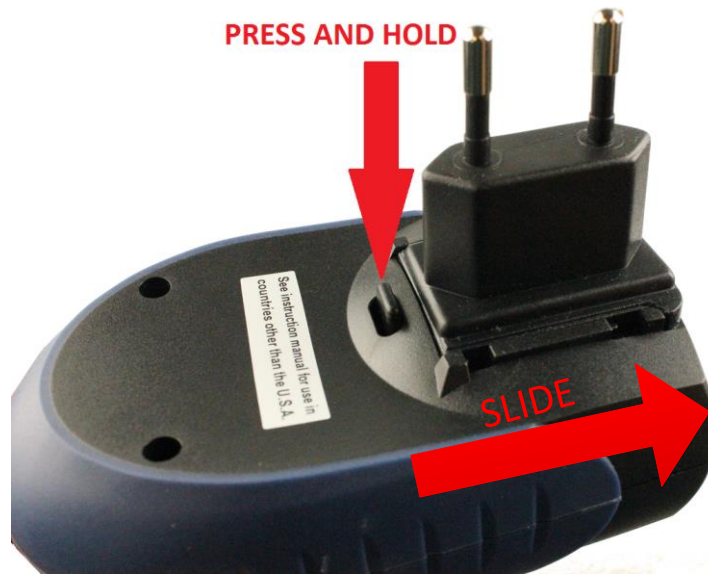


Figure 17 steps to remove a mounted plug adapter.

Verification of the setup

Follow the next checks to verify a correct setup:

1. Is the EM capacitor probe connected to the input of the Amplifier?
2. Is the Amplifier connected to the 12V DC Power supply?

Please ensure that every check is successful, before going to the next one. If a check is not successful, refer to page 20 for solutions.

Check 1 - Is the EM capacitor probe connected to the input of the Amplifier?



Figure 18 EM capacitor probe connected to the Amplifier

Check 2 - Is the Amplifier connected to the 12V DC?

Check 3 - Is the low-noise amplifier connected to the downstream device?

Have questions?

1. Visit the Riscure Support Portal: <http://support.riscure.com>

Technical specifications

Operational conditions

- Room temperature 20 – 30 °C, (68 – 86 °F).



Maintain stable environmental conditions (temperature, humidity, airflow etc.) in order to reliably repeat tests and compare test results.



Unplugging the PSU from the product is not required, but recommended when not used for an extended time.

Power supply input

- Input: 100 – 240 V AC, 47 – 63 Hz
- Output: 12 V DC, max 2.5A
- Plug Dimension: Center-positive plug, outer-Ø 3.5 mm, inner-Ø 1.35 mm.



Use of a PSU other than supplied by Riscure is not supported. Power spikes may cause internal damage and loss of accuracy.

EM capacitor probe

- Bandwidth: 30 to 3000 MHz.
- Resolution: ~0.5 mm
- Probe tip diameter: ~4mm
- Connector output: SMB, male, jack
- Frequency response:

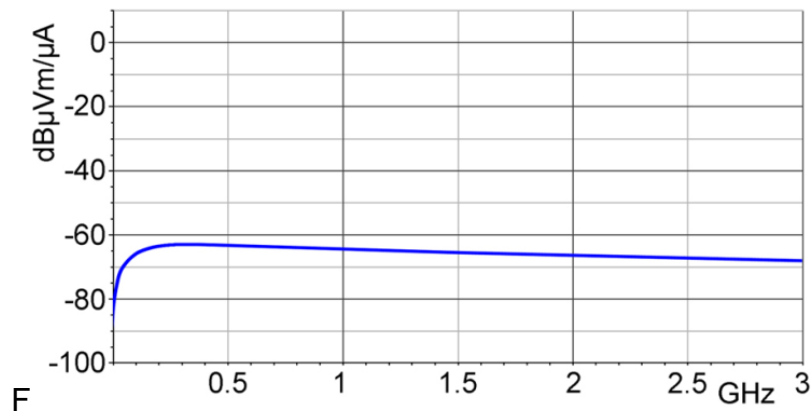


Figure 19 Frequency response of EM Cap. Probe (courtesy of LANGER EMV)

Low-noise amplifier

- Supply voltage: 12 Volts
- Current consumption: 50 mA
- Bandwidth: 100kHz to 3000 MHz.
- Typical gain: 20 dB.
- Max. Input power: +13 dBm.
- Noise figure: 4.5 dB
- Dimensions: 50 x 38 x 13mm
- Frequency response:

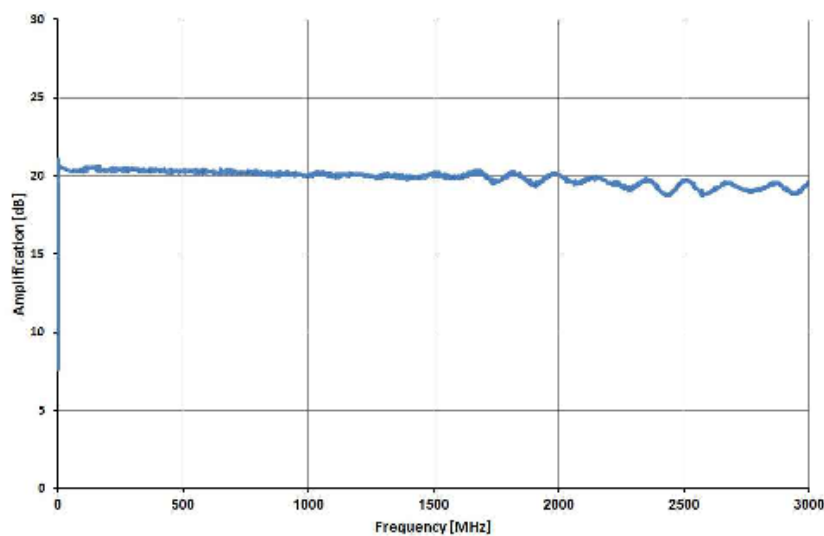


Figure 20 Frequency response of LNA (courtesy of LANGER EMV)

3D probe positioner

- Material: anodized light alloy, steel

Probe positioner mount (to EM Probe Station Z-axis)

- Material: Aluminum
- Center slot width: 4 mm

Probe positioner mount (to EM Probe Station base plate)

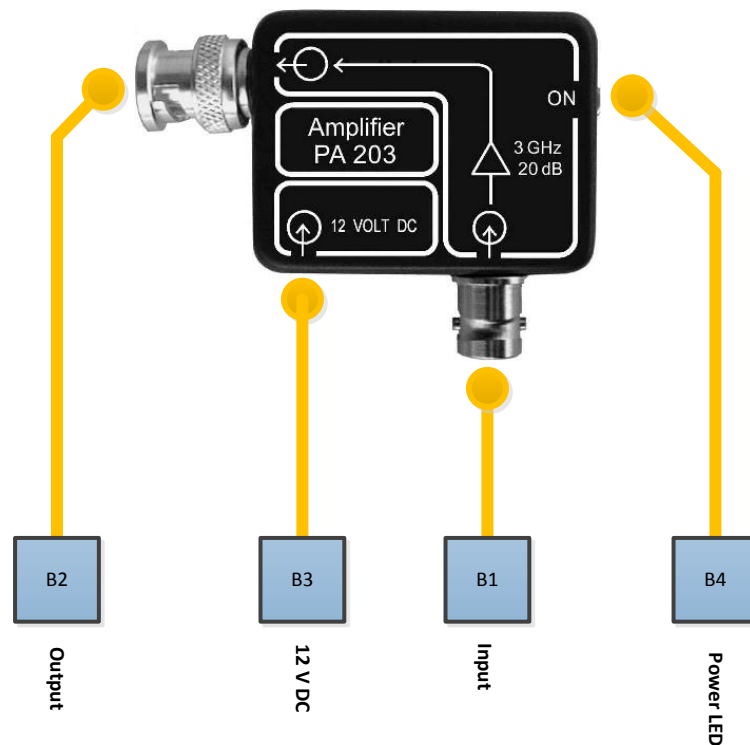
- Material: Plastic
- Center slot width: 5 mm

Product case

- EM Capacitor Probe:



- Amplifier:



Port	Label	Description
A1	Probe tip	The tip of the EM capacitor probe.
A2	Signal out	EM signal sensed by the EM capacitor probe. SMB connector, male, jack.
B1	Input port	Signal input to the amplifier. SMB connector, male, jack.
B2	Output port	Amplified signal out. SMB connector, male, jack.

Port	Label	Description
B3	12 V DC Socket	DC power supply socket.
B4	Power LED	Indicator of device power.