



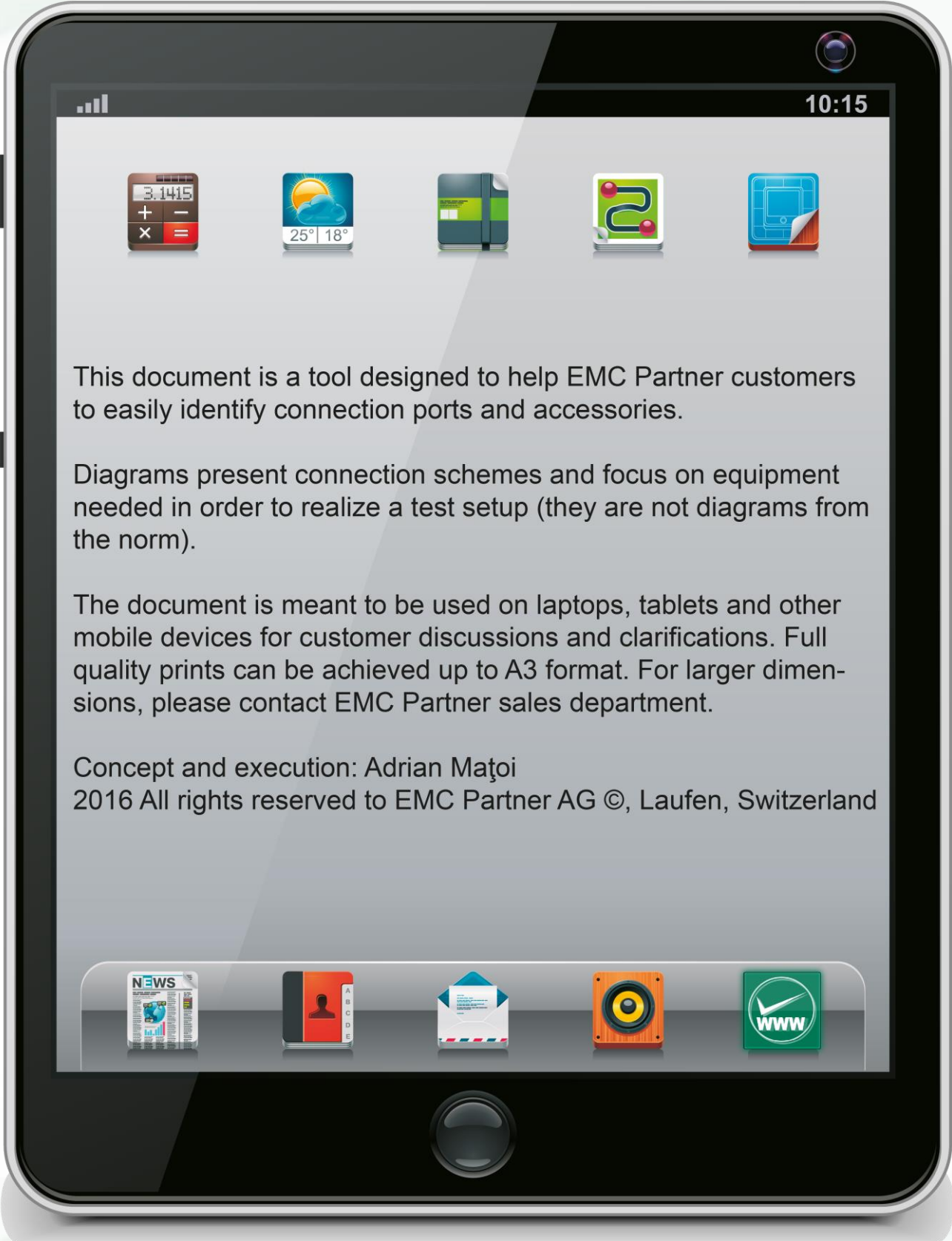
IMU USER GUIDE

COMPLETE CALIBRATION AND TEST SETUP DIAGRAMS



CONGRATULATIONS FOR
PURCHASING AN IMU4000 GENERATOR !

| EXCELLENCE IS AN ATTITUDE



Legend

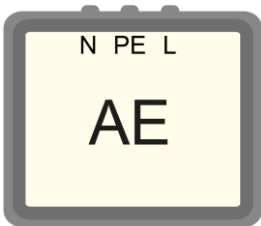
In most of the diagrams referring to calibration, an oscilloscope is present. EMCP does not deliver oscilloscopes, but can indicate the minimum required bandwidth according to application, see table below. Same bandwidth requirements apply for probes used in combination with the oscilloscope.

Standard	Minimum bandwidth for osc.
IEC 61000-4-2	2 GHz
IEC 61000-4-4	400 MHz
IEC 61000-4-5	10 MHz
IEC 61000-4-8	10 kHz
IEC 61000-4-9	10 MHz
IEC 61000-4-11	10 MHz
IEC 61000-4-12	20 MHz
IEC 61000-4-16	10 MHz
IEC 61000-4-19	10 MHz
IEC 61000-4-29	10 MHz
IEC 61000-4-34	10 MHz

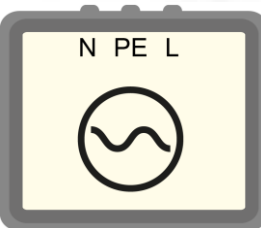
Following conventions are used in the guide:



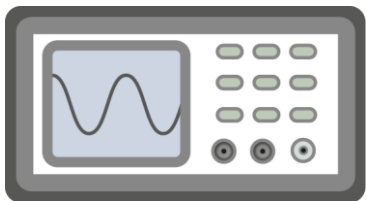
Equipment Under Test, could be single phase, three phase (when marked) or equipped with I/O ports



Auxiliary Equipment, could be single phase, three phase (when marked) or equipped with I/O ports



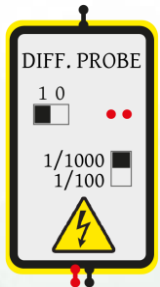
AC power source: could be grid connection or dedicated power source, one phase or three phase (when marked)



Oscilloscope



Current probes



Voltage differential probe

When calibrating the CDNs for supply lines, power should be disconnected from EUT power input.

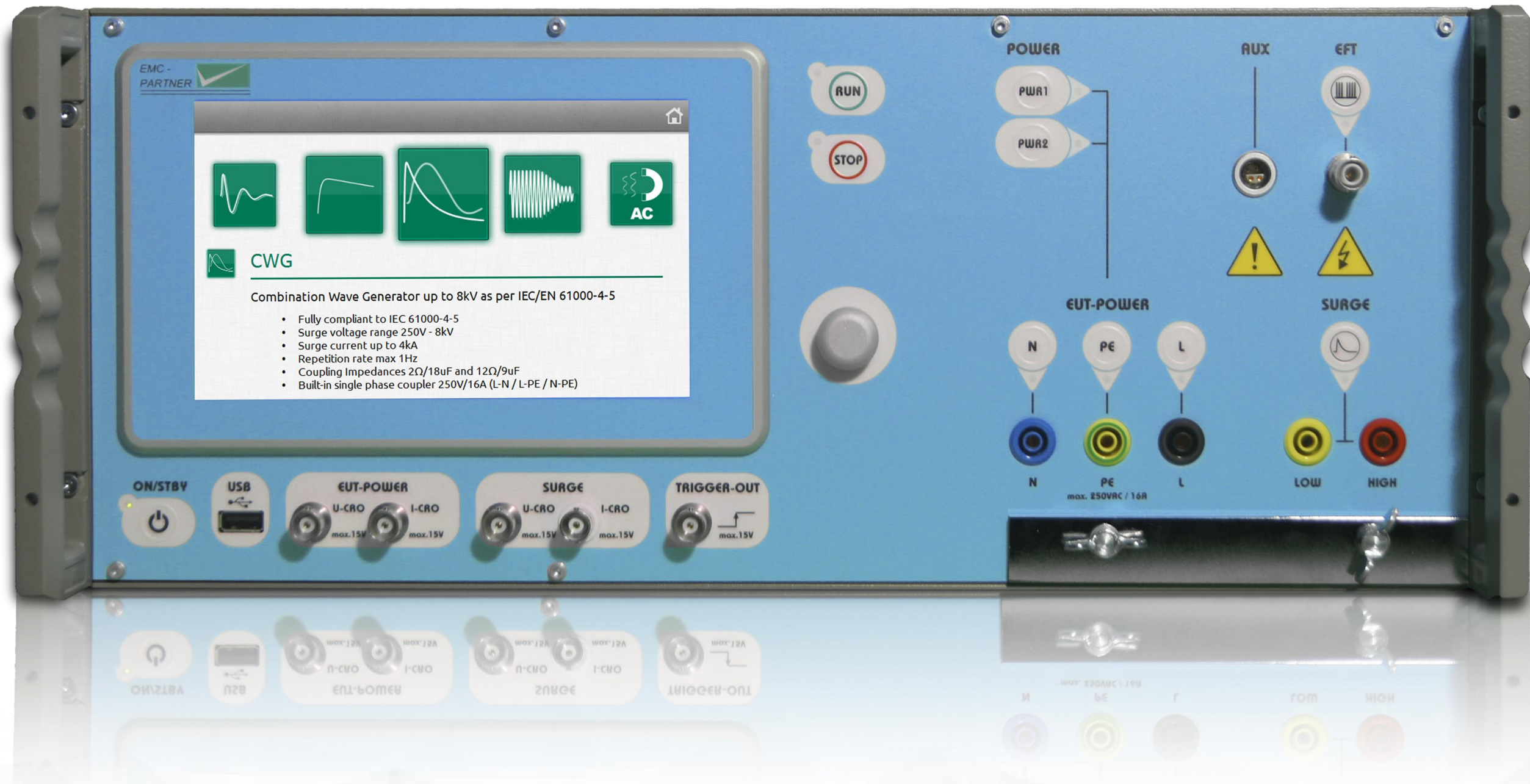
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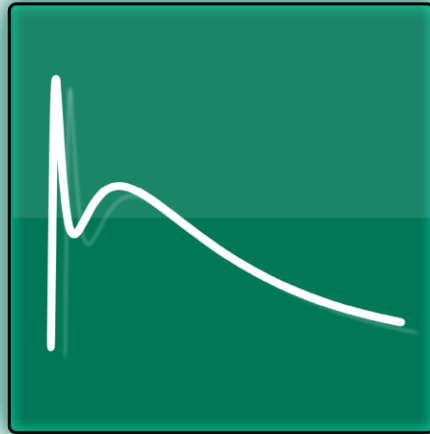
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1. IMU4000 and accessories



1.1. ESD calibration and test setup as per IEC 61000-4-2 latest edition

IEC 61000-4-2 Edition 2.0 / 2008

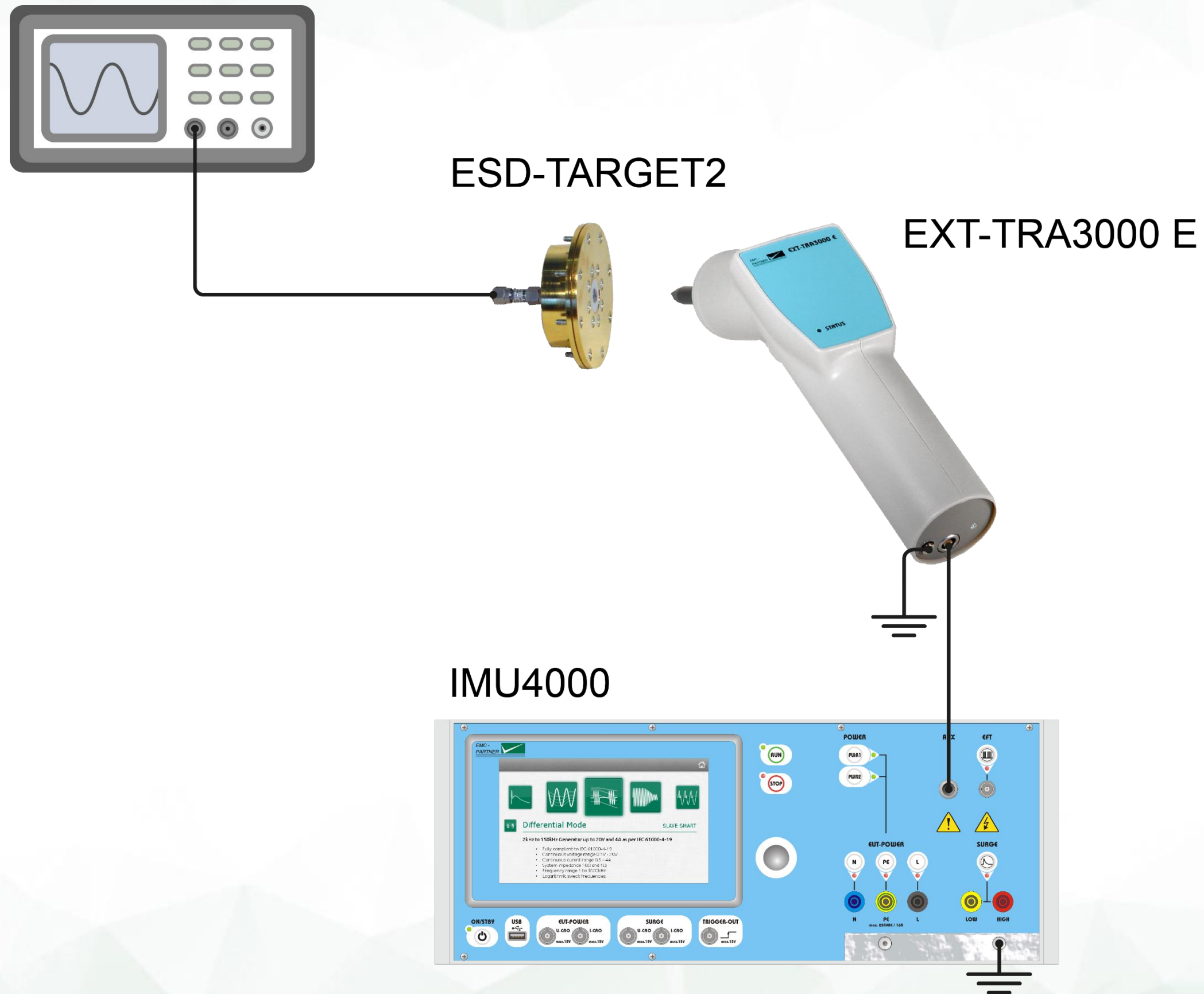


Contact discharge		Air discharge	
Level	Voltage [kV]	Level	Voltage [kV]
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
x	special	x	special

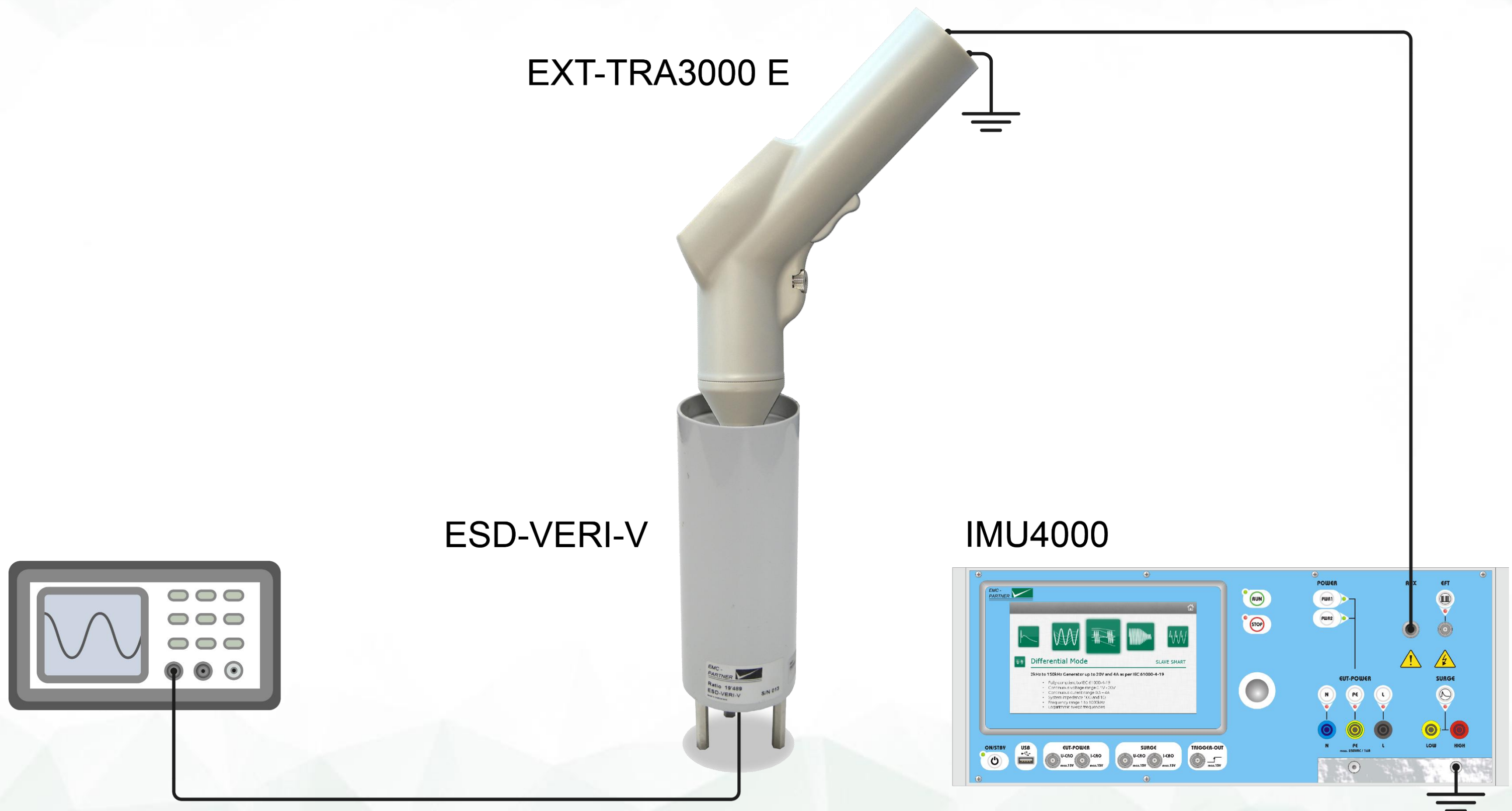
Contact discharge current calibration

Level	$V \pm 5\%$ [kV]	$t_r \pm 25\%$ [ns]	1st I_{peak} $\pm 15\%$ [A]	I_{peak} 30ns $\pm 30\%$ [A]	I_{peak} 60ns $\pm 30\%$ [A]
1	2	0.8	7.5	4	2
2	4	0.8	15	8	4
3	6	0.8	22.5	12	6
4	8	0.8	30	16	8

1.1.1. ESD: IMU4000, EXT-TRA3000 E, calibration setup – current



ESD-TARGET2 includes a 20 dB attenuator and a 1 m coaxial cable.

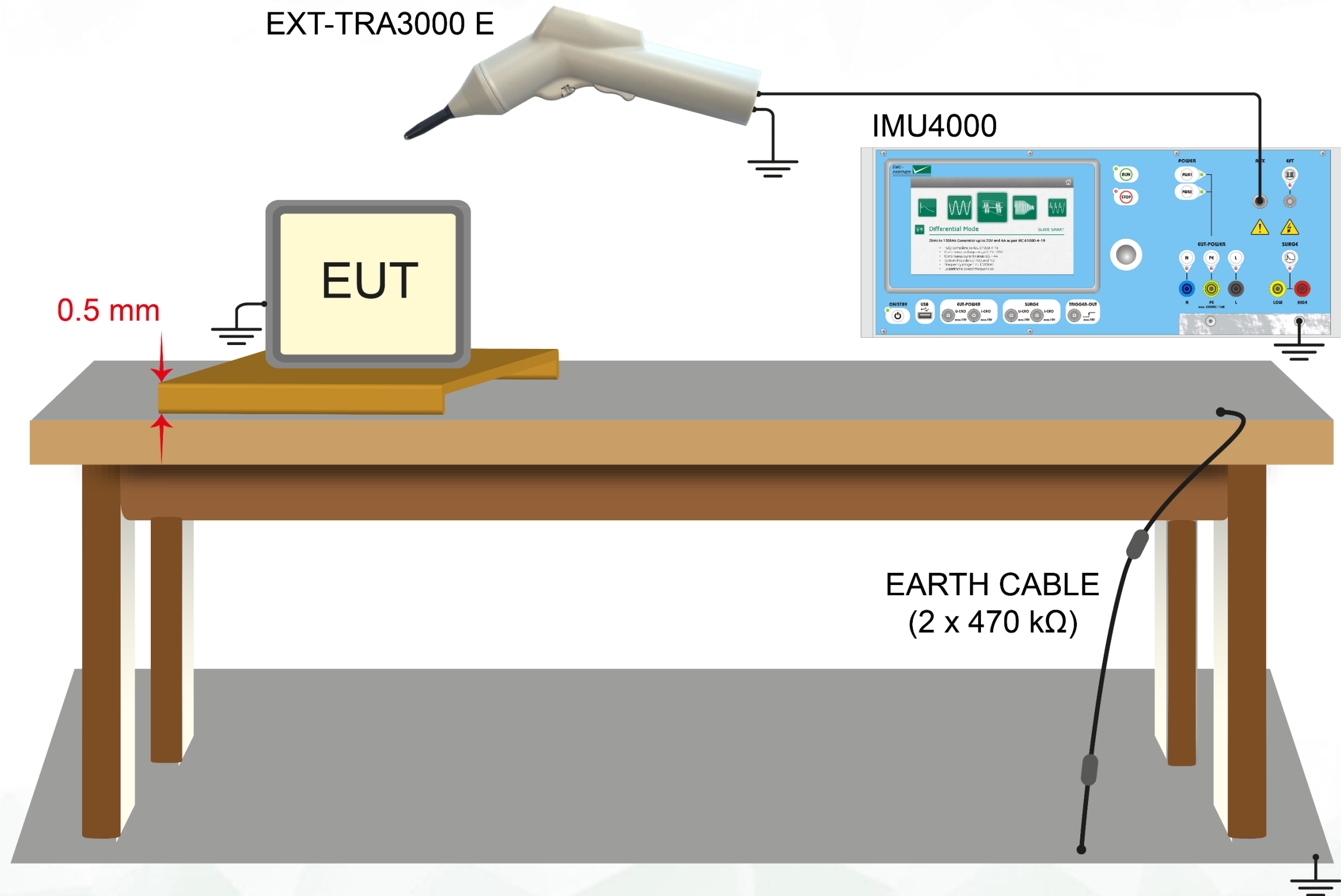
1.1.2. ESD: IMU4000, EXT-TRA3000 E, *optional* verification setup – voltage

Verification of output voltage level is optional in IEC 61000-4-2, but required in other norms like for example MIL-STD-461G CS118.

1.1.3. ESD: IMU4000, EXT-TRA3000 E, ESD-STAND Ed2, *optional* stand for fixed point tests

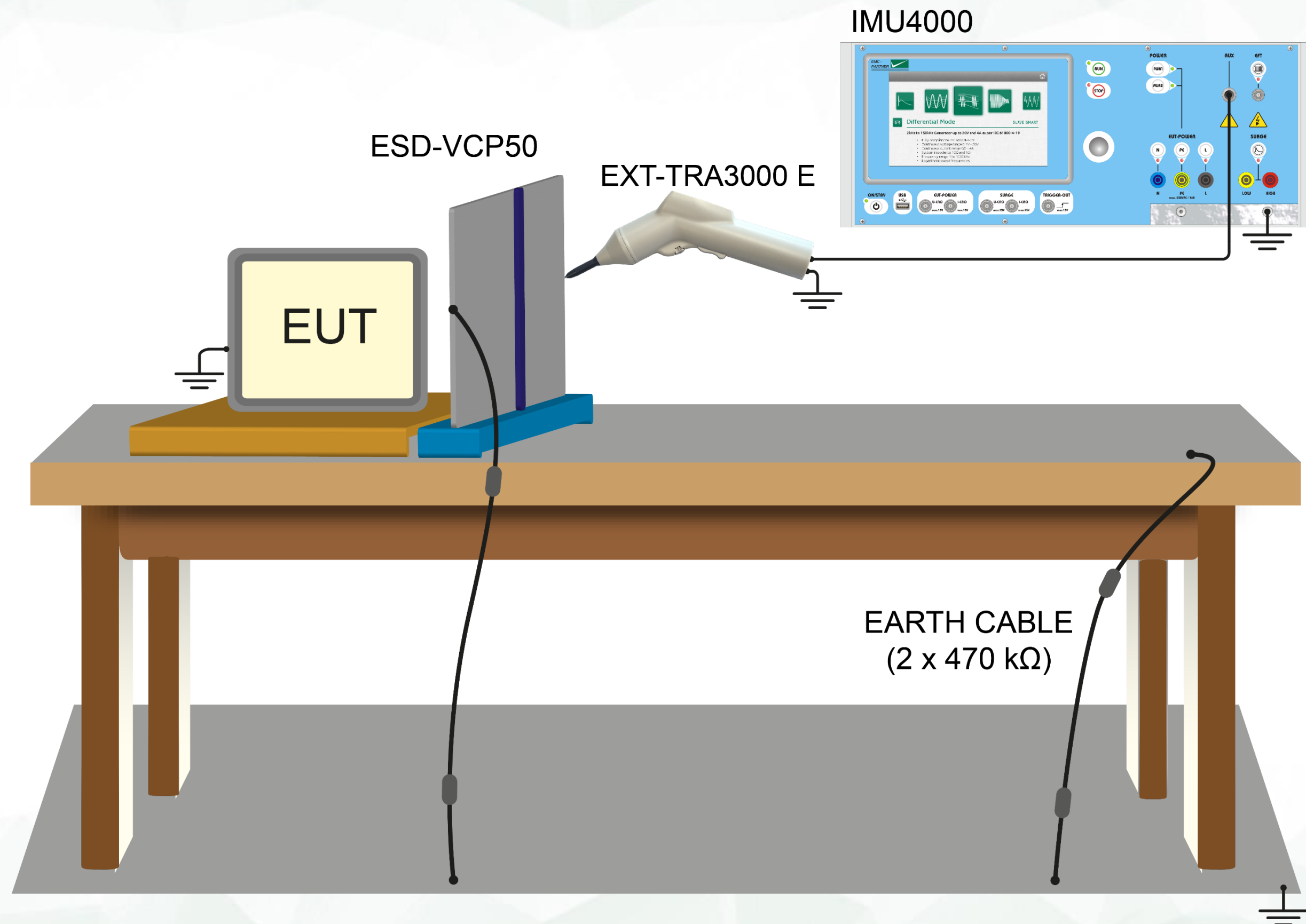
The stand is optional, recommended for tests that require many discharges in a fixed point of EUT.

1.1.4. ESD: IMU4000, EXT-TRA3000 E, test setup direct discharge



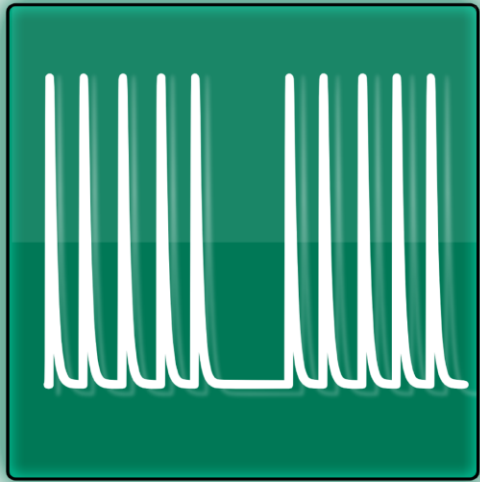
Precise dimensions, distances can be found in IEC 61000-4-2.

1.1.5. ESD: IMU4000, EXT-TRA3000 E, test setup indirect discharge



For indirect discharge test, the norm requires a Vertical Coupling Plate.

IEC 61000-4-4 Edition 3.0 / 2012

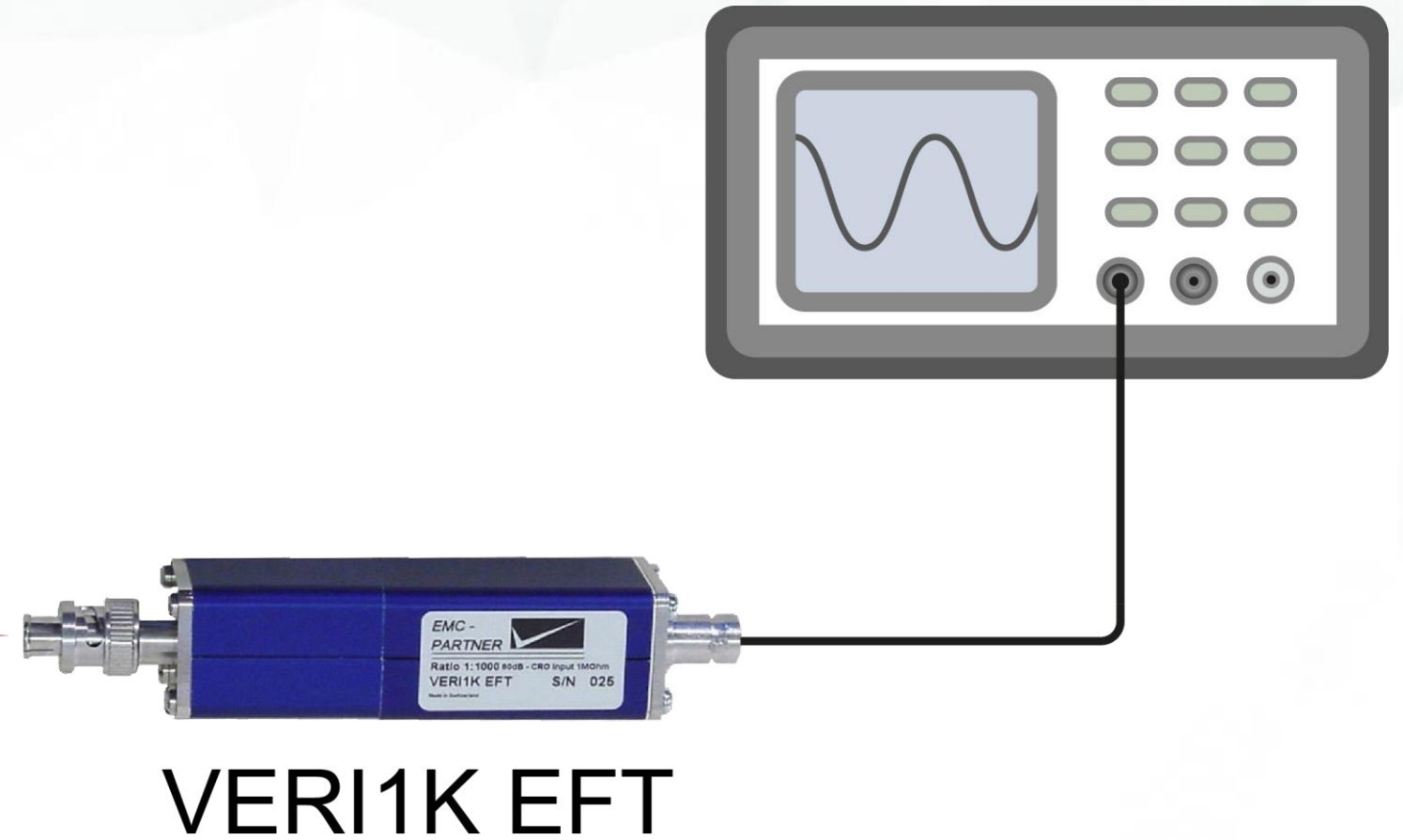
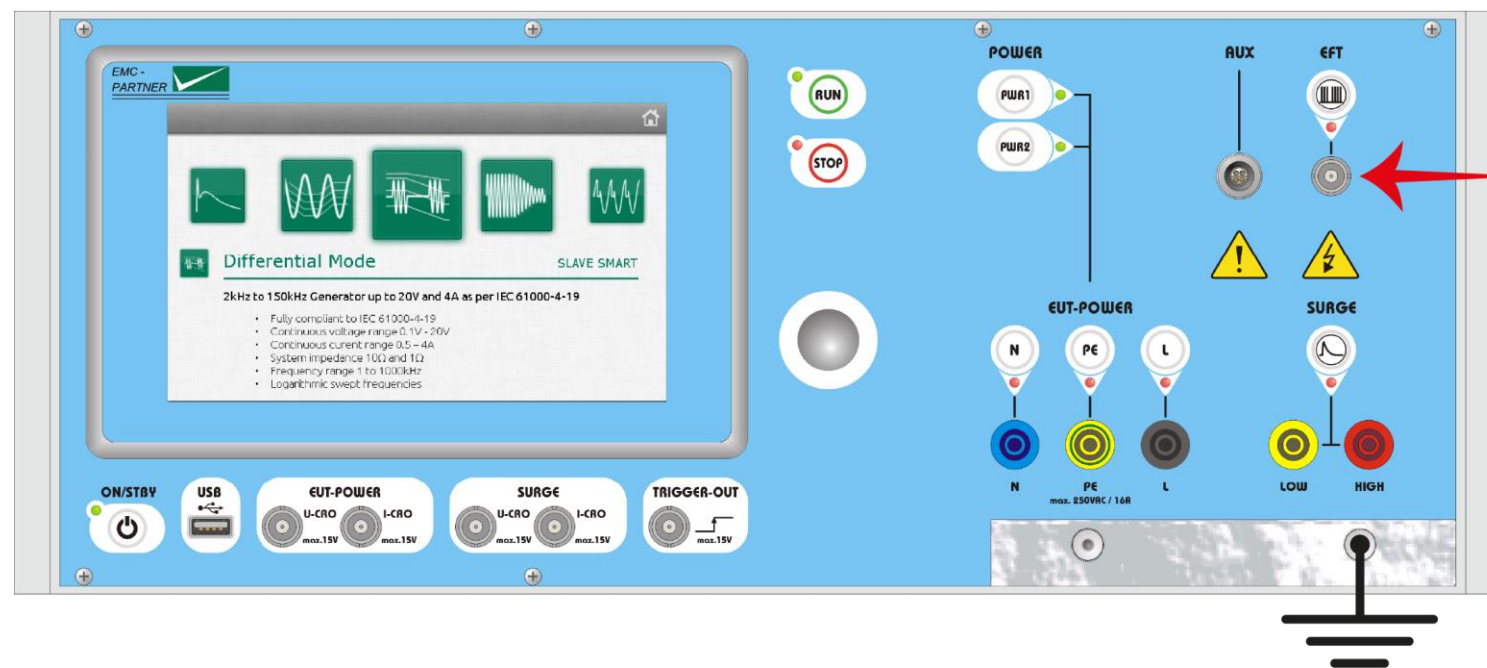


Changes from edition 2 to edition 3:

- * Figures moved within the text where they are called up
- * Mathematical formula for nominal EFT pulse
- * Defined characteristics of test load impedance (up to 400 MHz)
- * CDN calibration enlarged tolerances
- * Calibration of coupling clamp with a transducer plate
- * New test setups
- * Measurement uncertainty (MU)

1.2.1. EFT: IMU4000 F/F5, direct output, calibration setup with VERI1K EFT

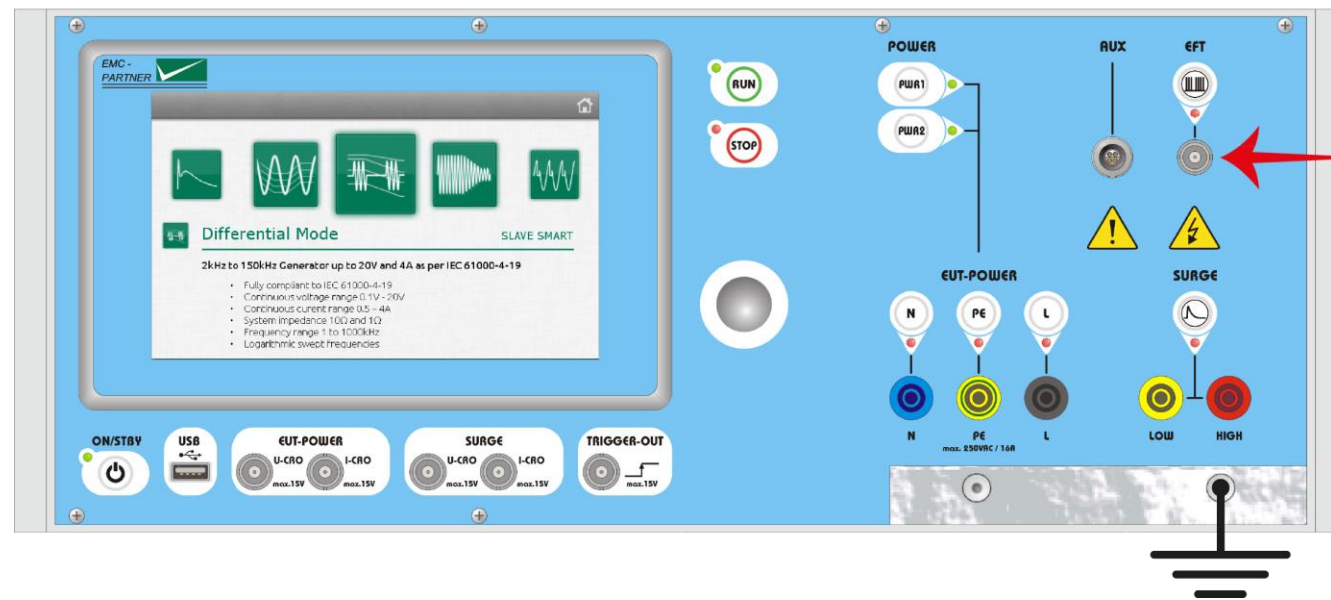
IMU4000



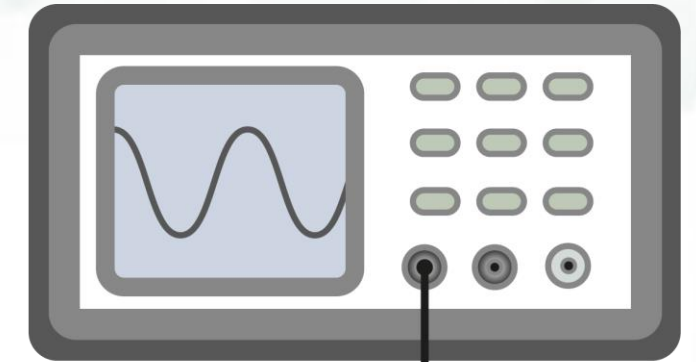
No additional attenuators are required for normal oscilloscopes (10 V input range).

1.2.2. EFT: IMU4000 F/F5, direct output, calibration setup with VERI50 EFT

IMU4000



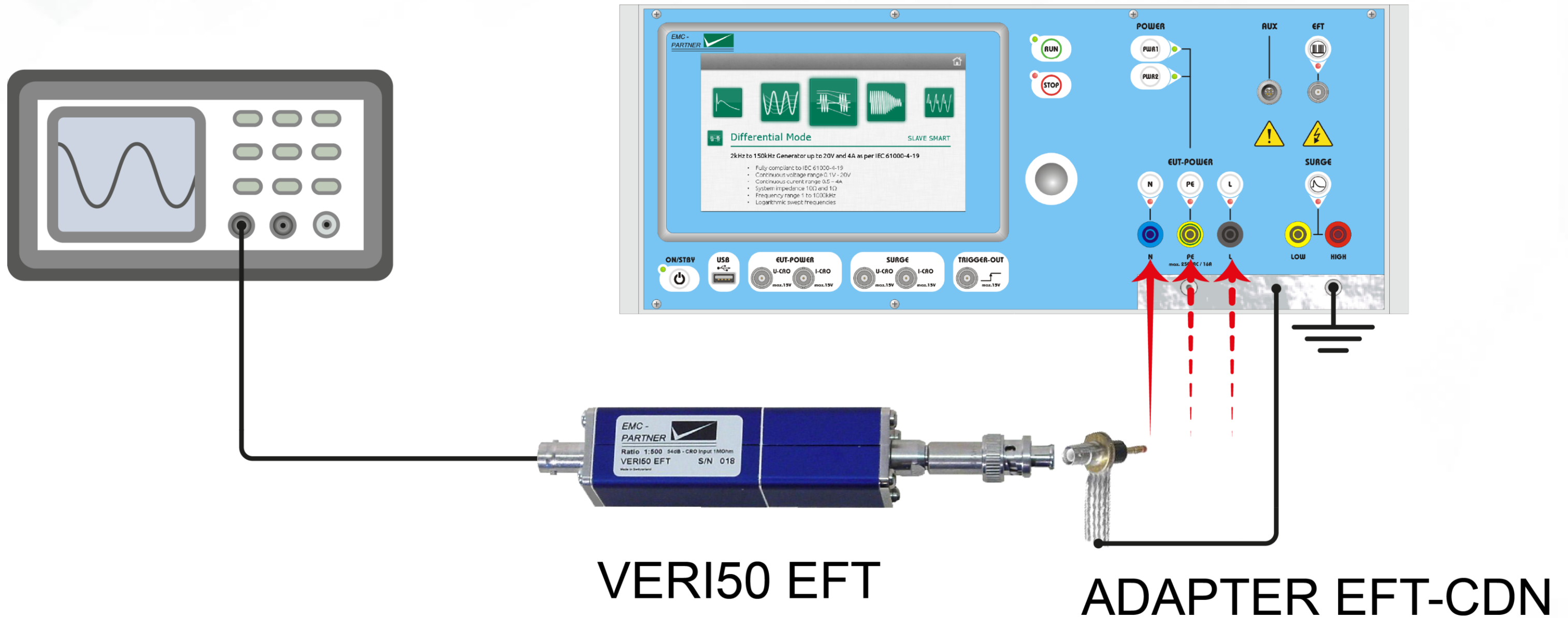
VERI50 EFT



No additional attenuators are required for normal oscilloscopes (10 V input range).

1.2.3. EFT: IMU4000 F/F5, internal CDN, calibration setup

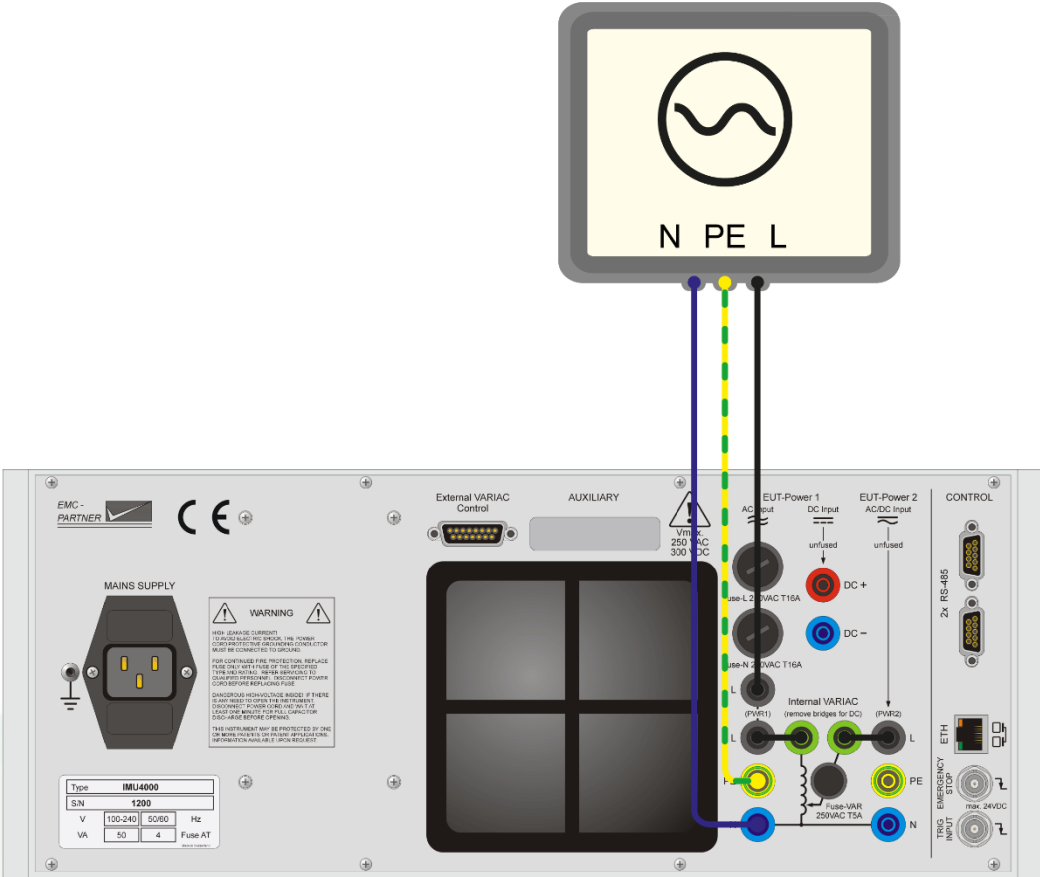
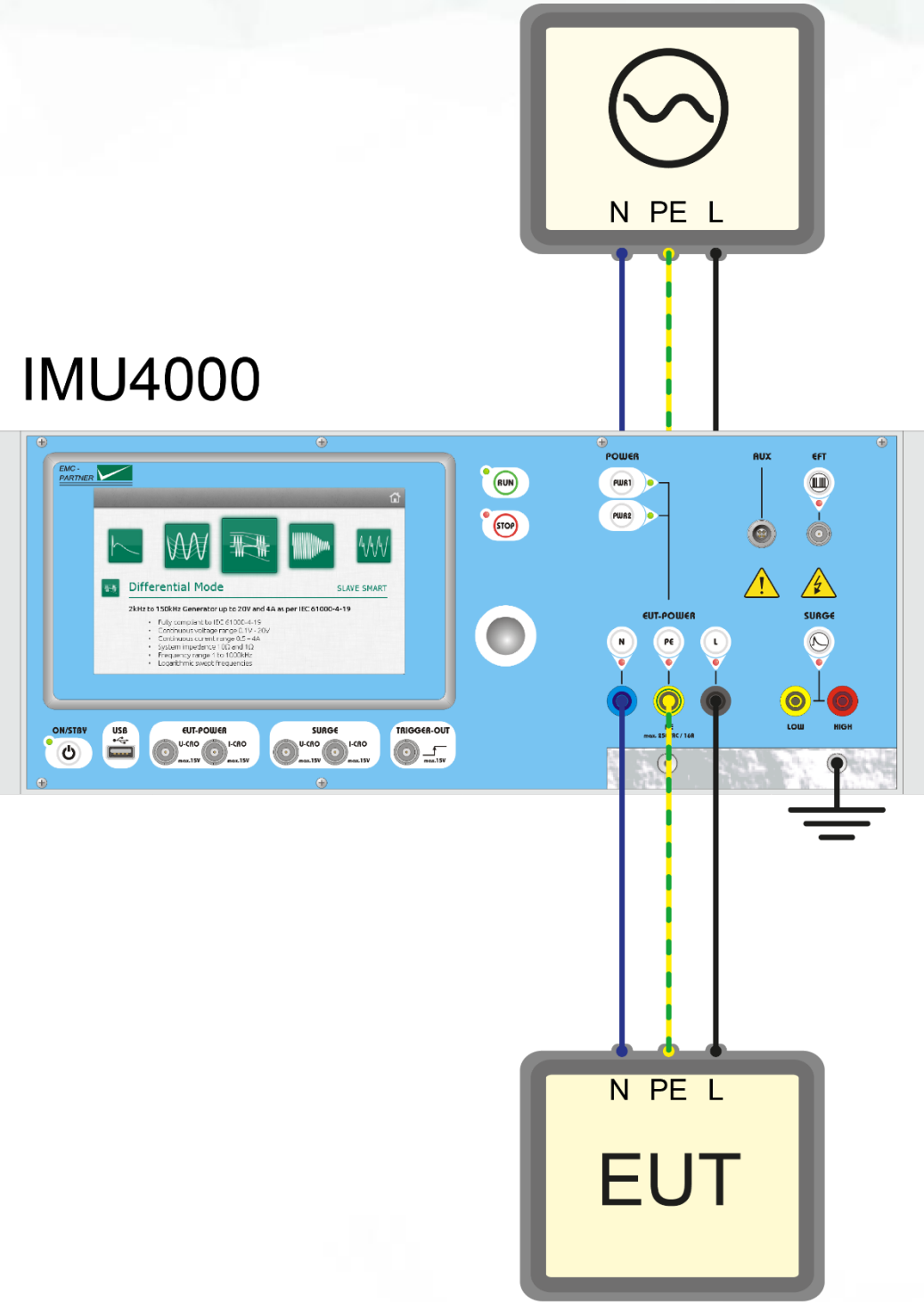
IMU4000



Coupling is set to Common Mode (L1+N+PE → Gnd) and signal is measured on each line separately. No power on CDN input.

1.2.4. EFT: IMU4000 F/F5, internal CDN, test setup

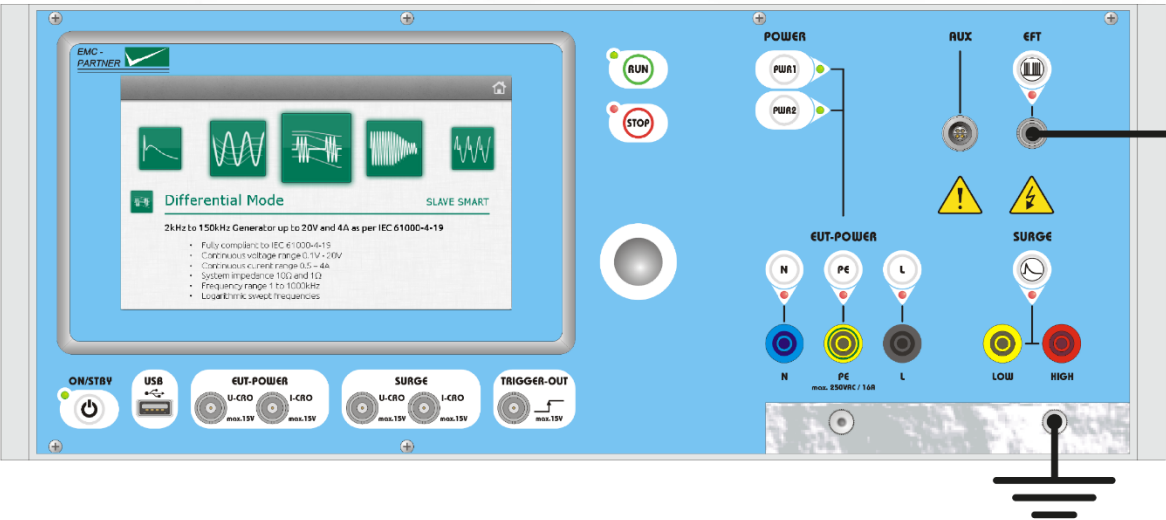
IMU4000



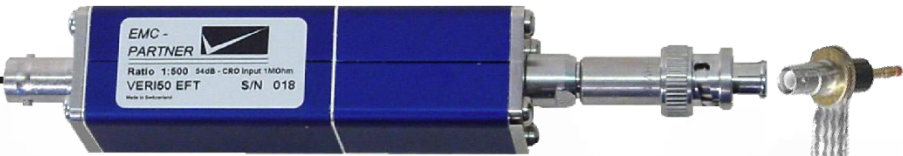
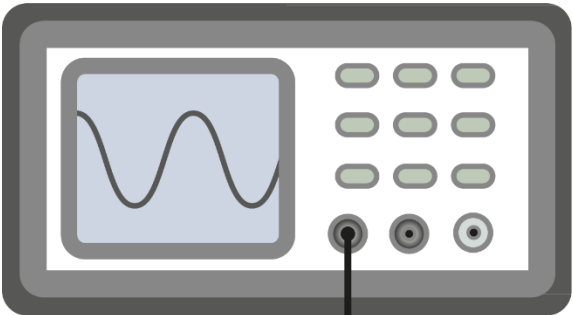
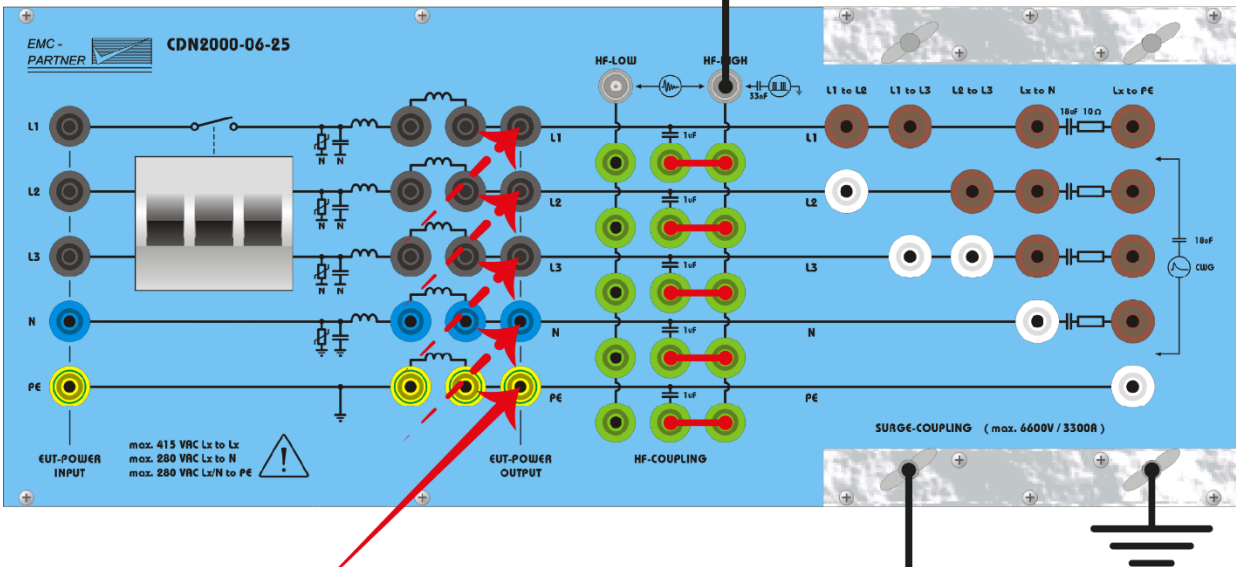
Coupling is set to Common Mode (L1+N+PE → Gnd).

1.2.5. EFT: IMU4000 F/F5, CDN2000-06-25 (or any three phase manual CDN), calibration setup

IMU4000



CDN2000-06-25



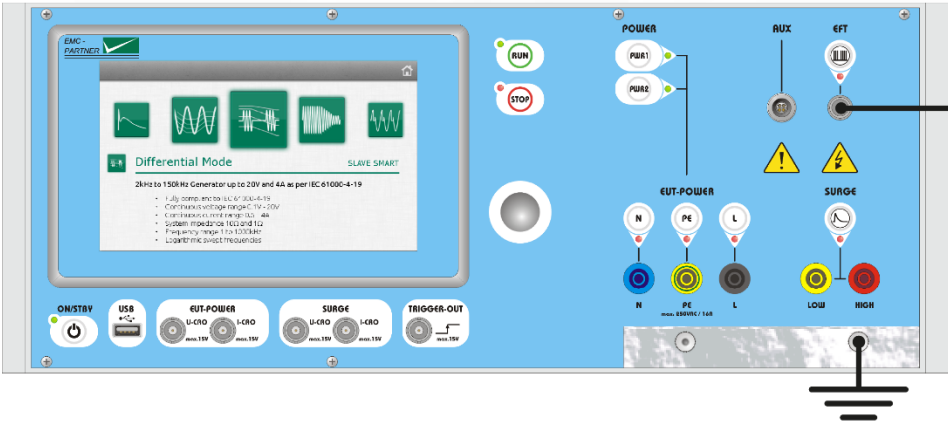
VERI50 EFT

ADAPTER EFT-CDN

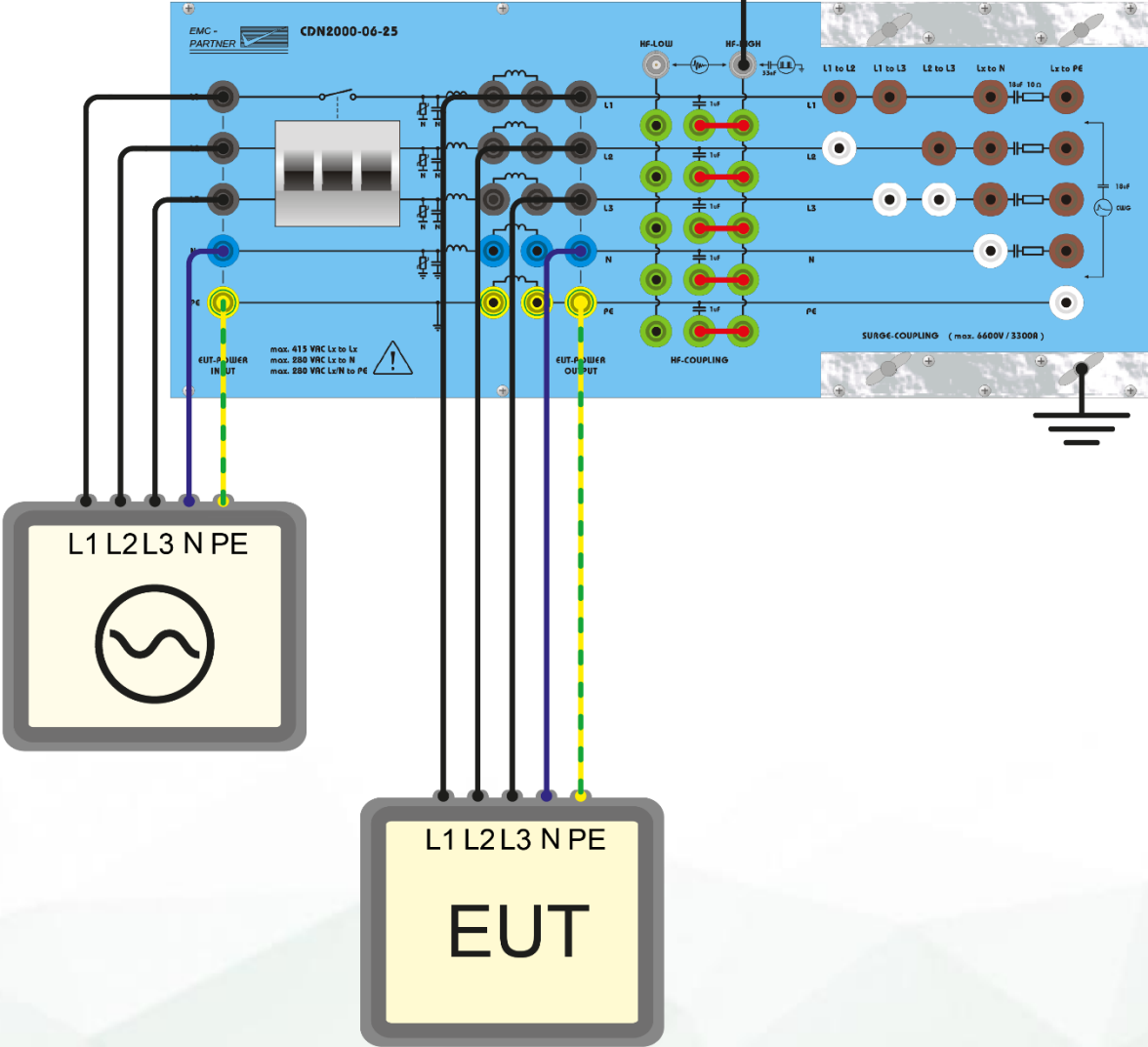
Common Mode coupling (L1+L2+L3+N+PE → Gnd), signal measured on each line separately with VERI50 EFT (1K not required). No power on CDN.

1.2.6. EFT: IMU4000 F/F5, CDN2000-06-25 (or any three phase manual CDN), test setup

IMU4000



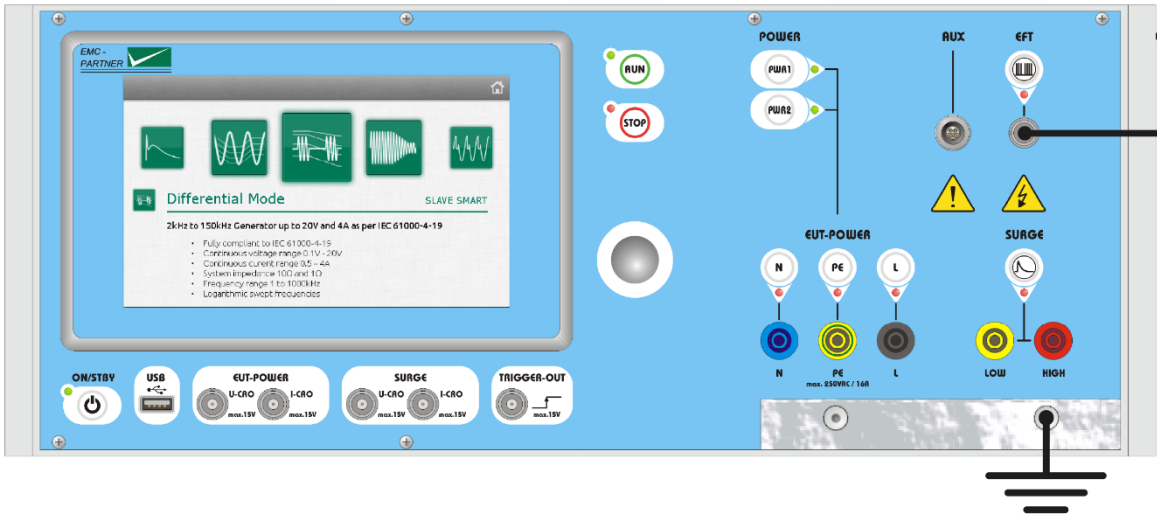
CDN2000-06-25



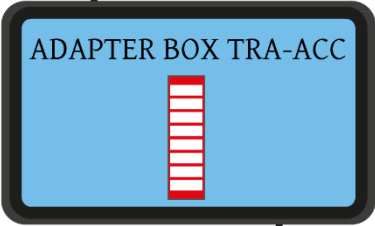
Coupling is set to Common Mode (L1+L2+L3+N+PE → Gnd).

1.2.7. EFT: IMU4000 F/F5, CDN3000A-06-32 (or any three phase automatic CDN 32A and 63A), calibration setup

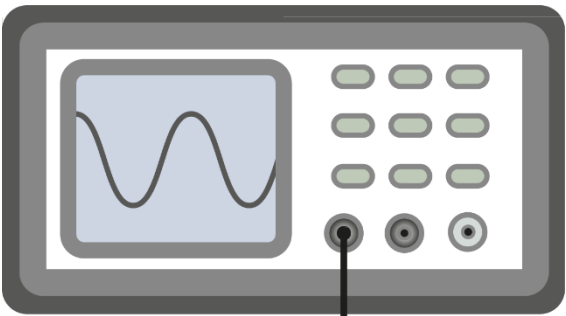
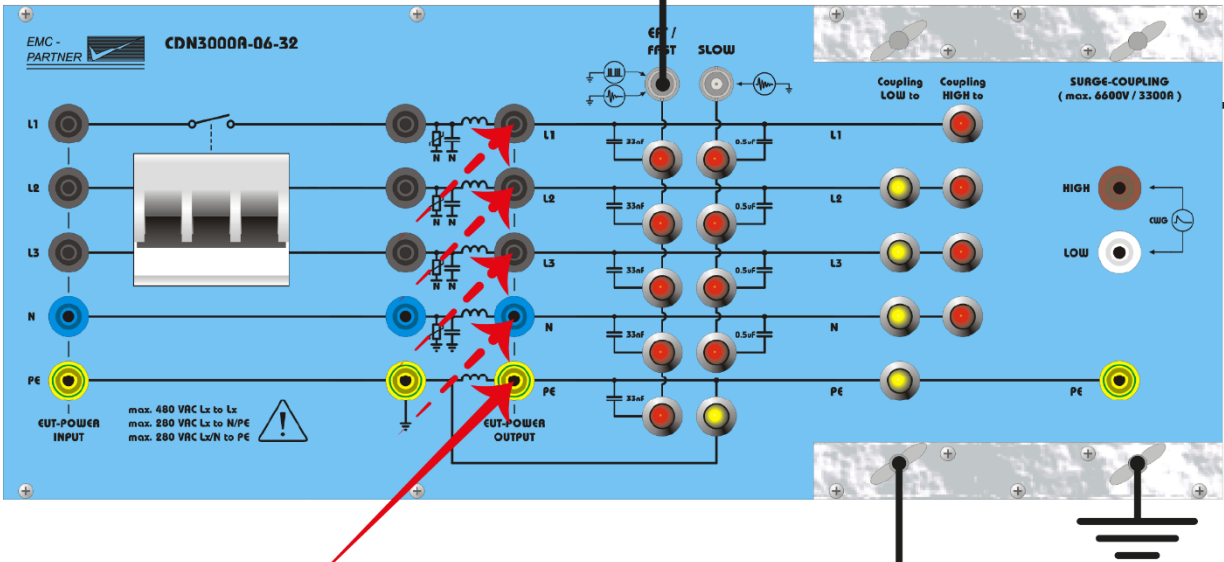
IMU4000



TRA-ACC



CDN3000A-06-32



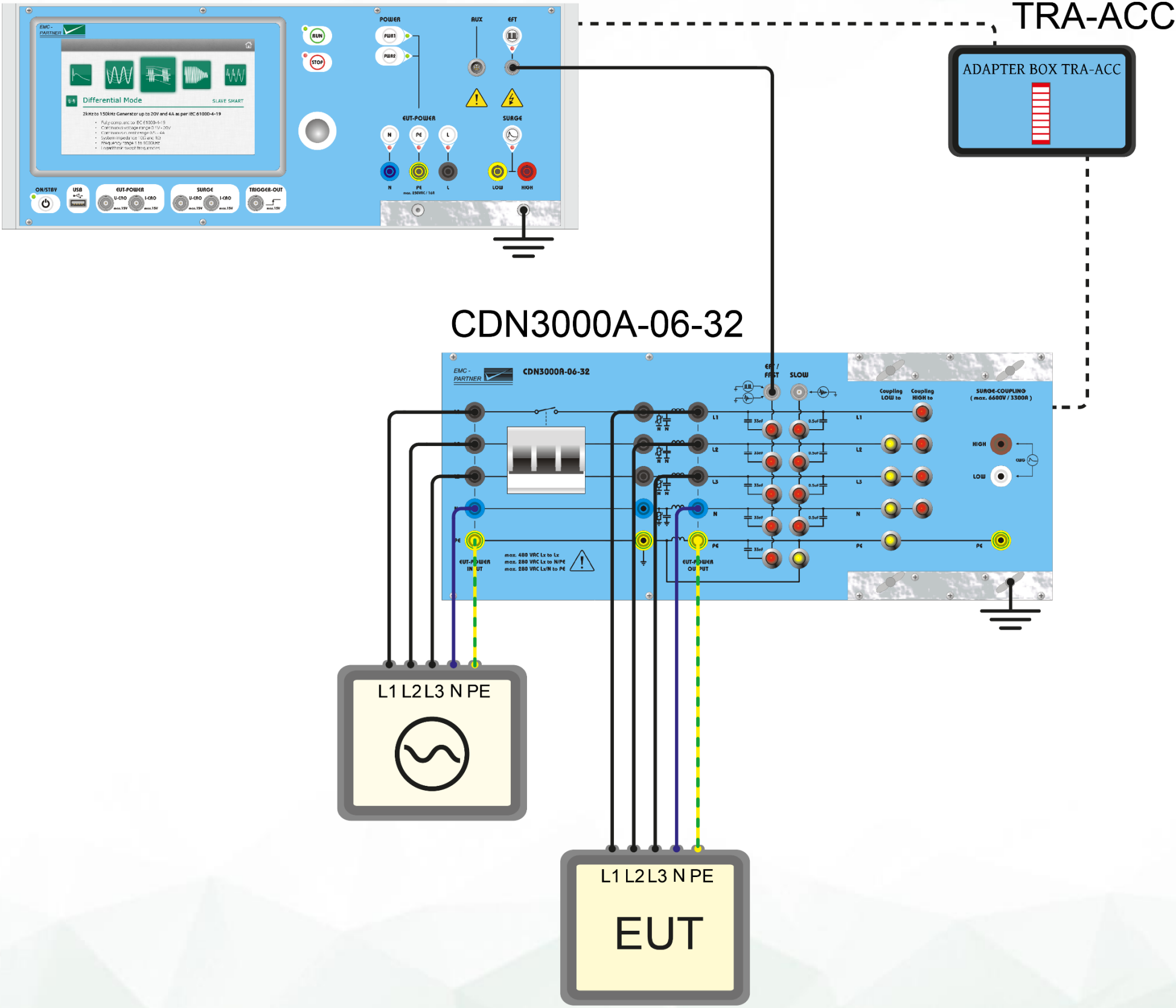
VERI50 EFT

ADAPTER EFT-CDN

Coupling is set to Common Mode (L1+L2+L3+N+PE → Gnd) and signal is measured on each line separately with VERI50 EFT (1K not required).

1.2.8. EFT: IMU4000 F/F5, CDN3000A-06-32 (or any three phase automatic CDN 32A and 63A), test setup

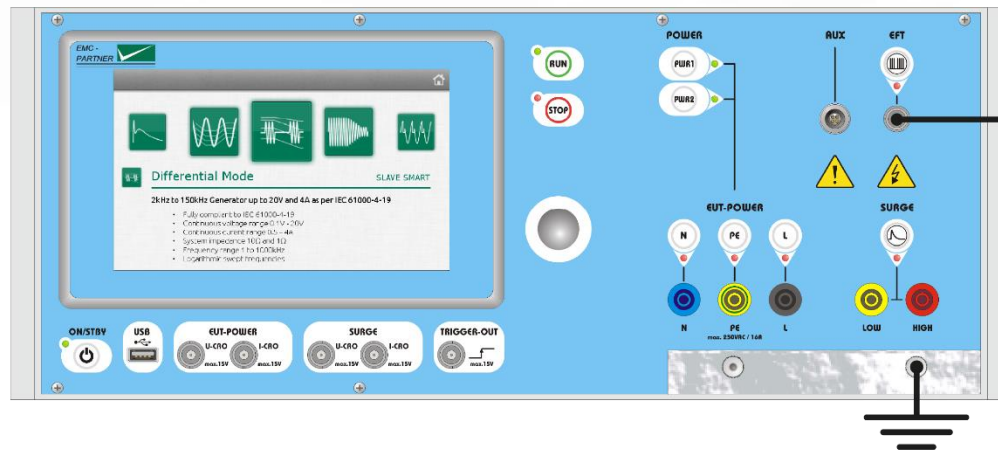
IMU4000



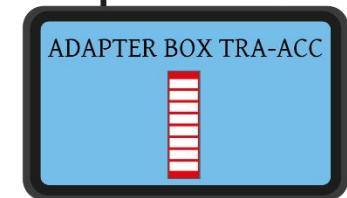
Coupling is set to Common Mode (L1+L2+L3+N+PE → Gnd).

1.2.9. EFT: IMU4000 F/F5, CDN-A-3P-100-480 F-S (also 690V version), calibration setup

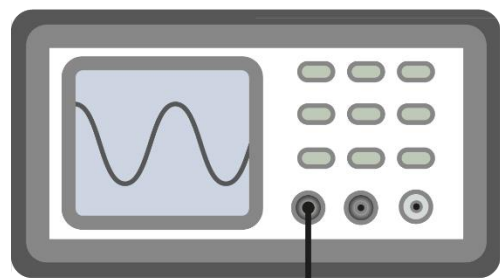
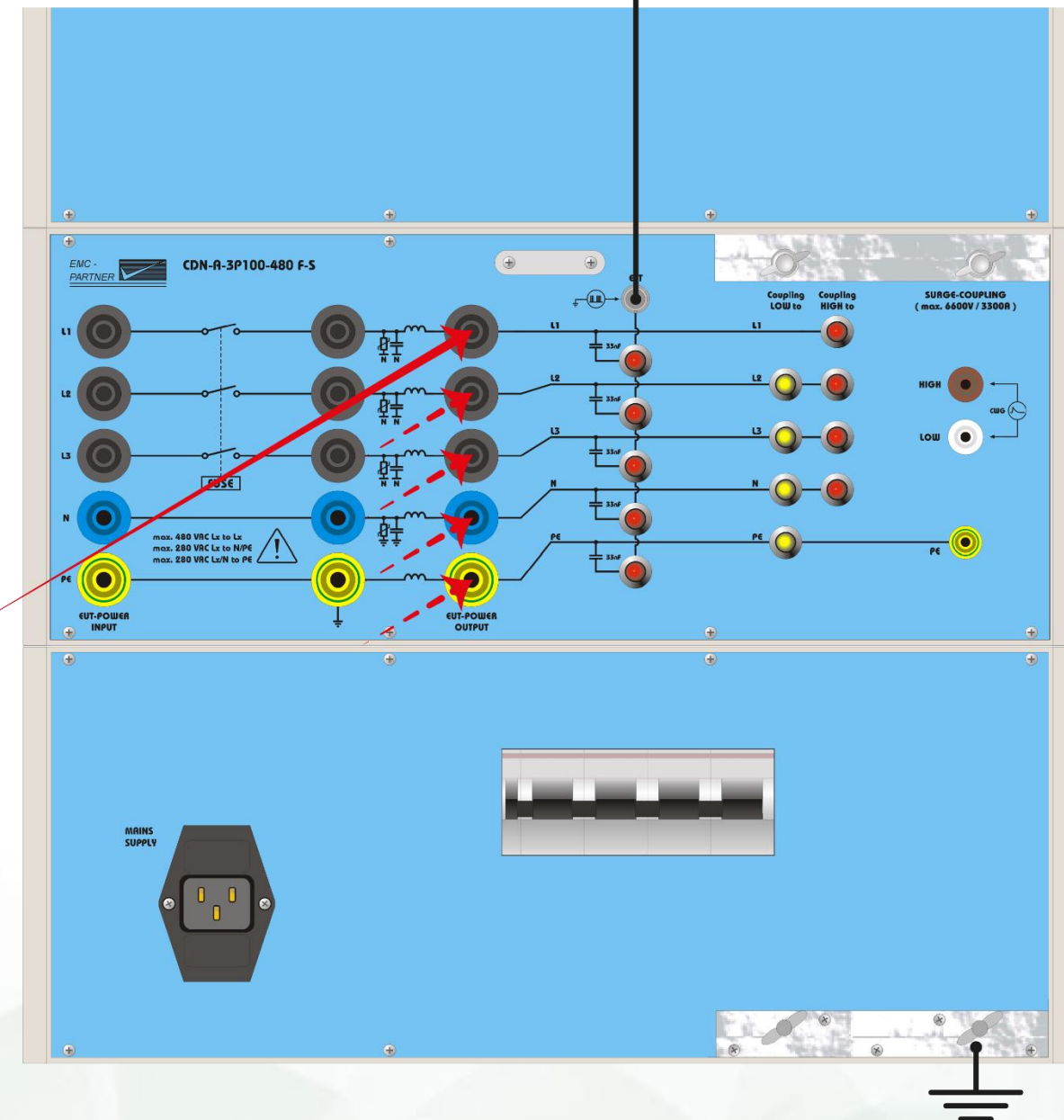
IMU4000



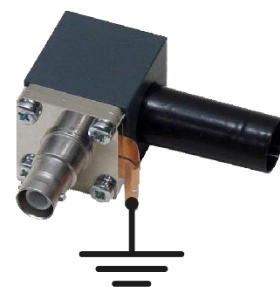
TRA-ACC



CDN-A-3P100-480 F-S

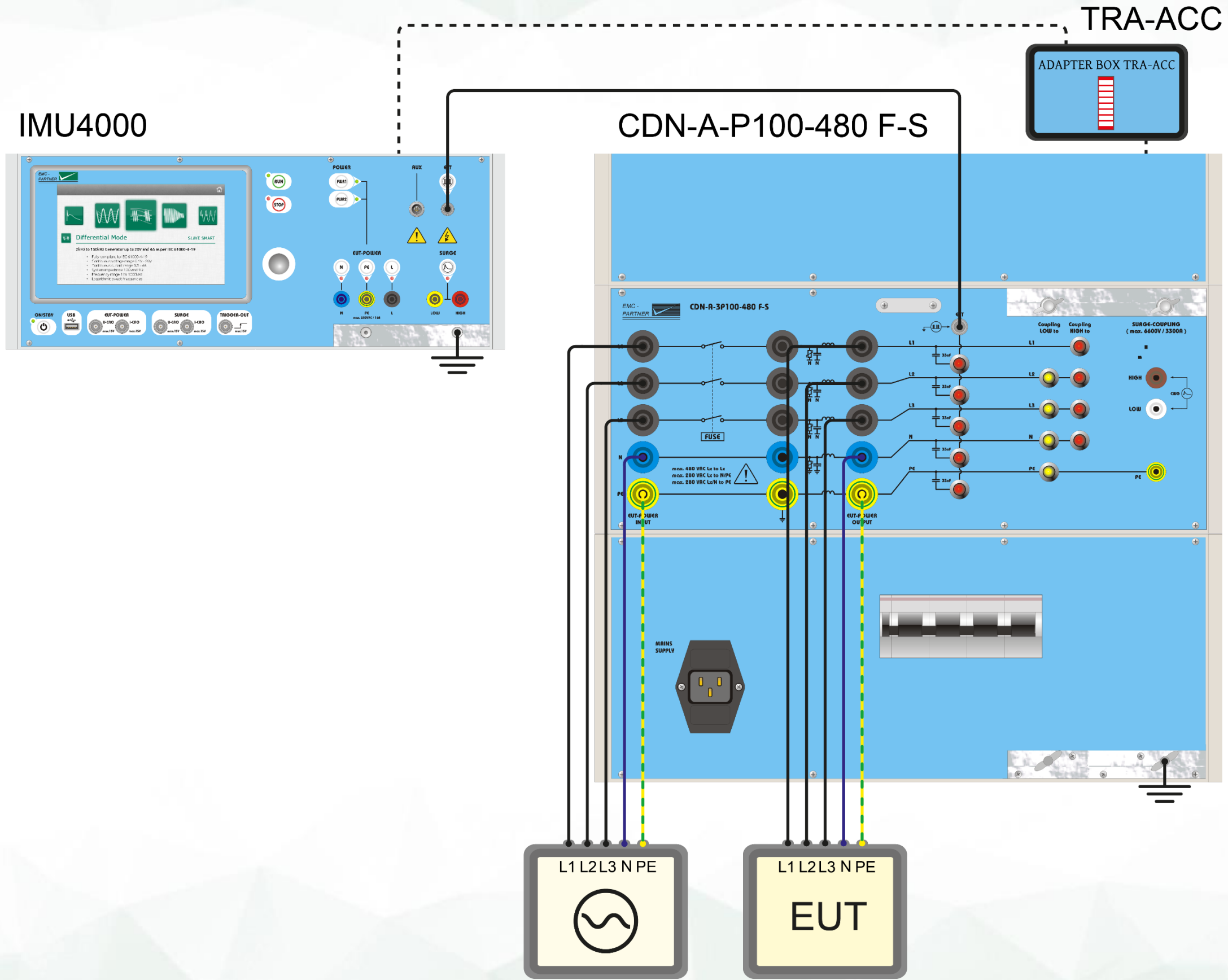


VERI50 EFT

ADAPTER
EFT-100

Coupling is set to Common Mode ($L1+L2+L3+N+PE \rightarrow \text{Gnd}$) and signal is measured on each line separately with VERI50 EFT (1K not required).

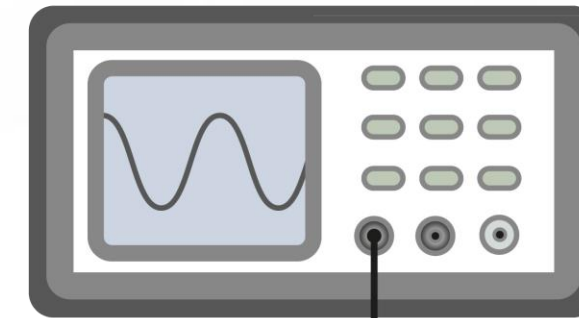
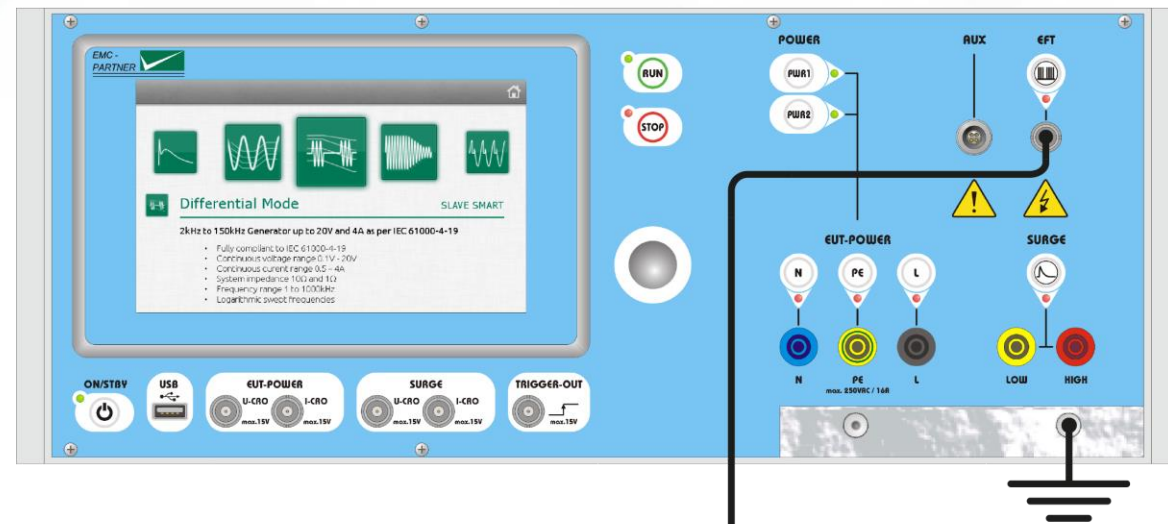
1.2.10. EFT: IMU4000 F/F5, CDN-A-3P-100-480 F-S (also 690V version), test setup



Coupling is set to Common Mode (L1+L2+L3+N+PE → Gnd).

1.2.11. EFT: IMU4000 F/F5, CN-EFT1000 (suitable for testing all types of I/O lines), calibration setup

IMU4000



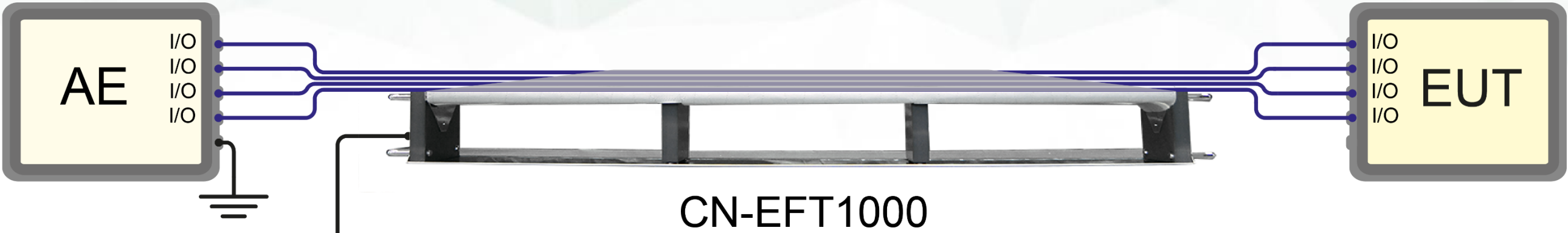
VERI50 EFT

VERI-CP-EFT

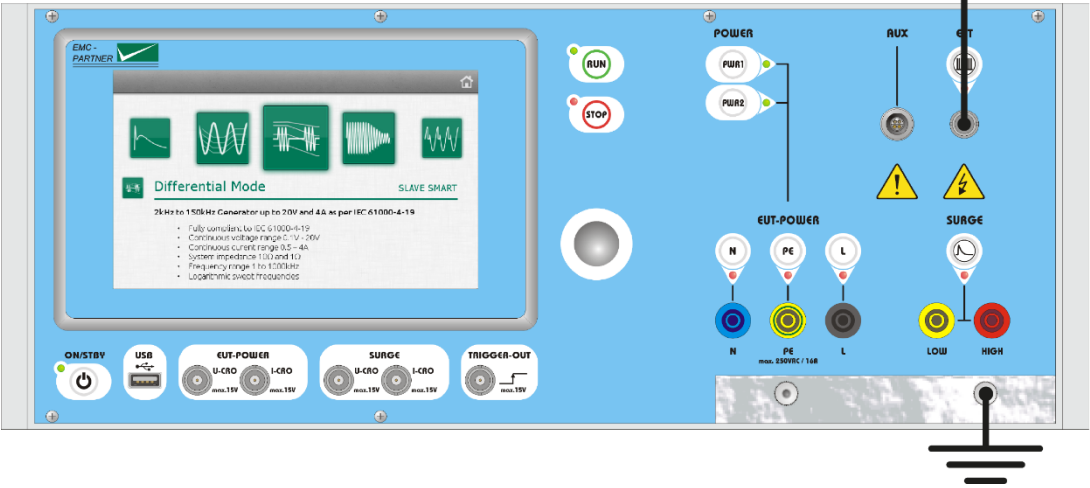
CN-EFT1000

Only calibration with VERI50 EFT is required, calibration with VERI1K EFT does not apply.

1.2.12. EFT: IMU4000 F/F5, CN-EFT1000 (suitable for testing all types of I/O lines), test setup



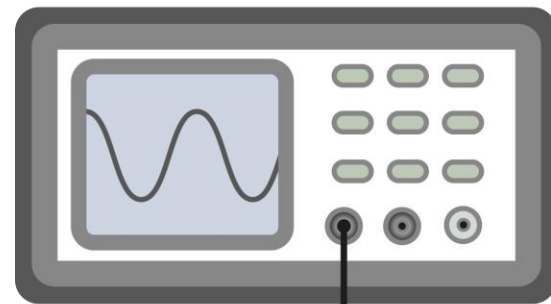
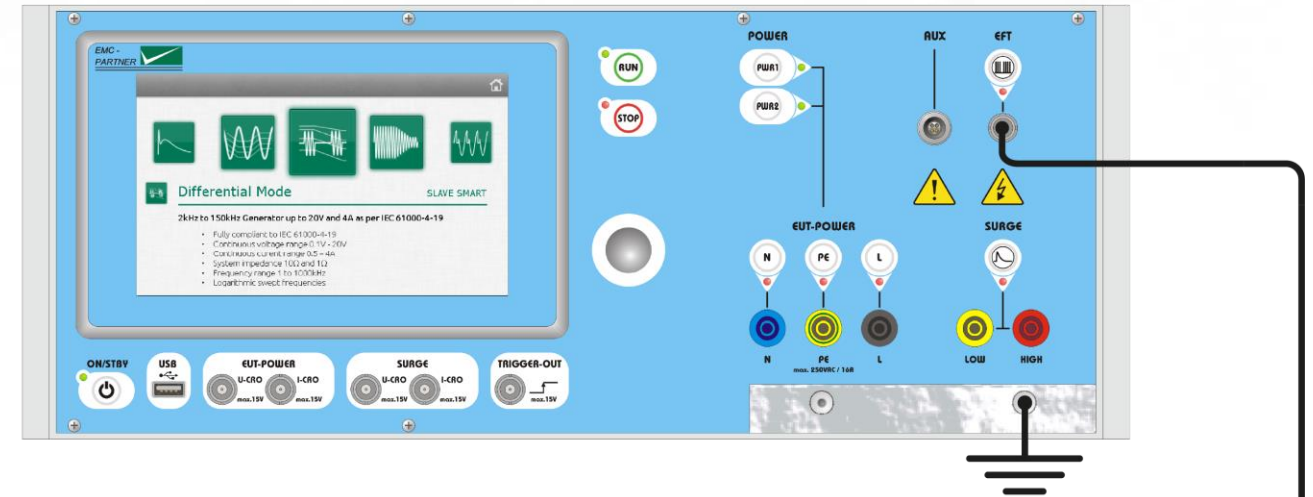
IMU4000



CN-EFT1000 is the only coupling element for burst signal on I/O lines.

1.2.13. EFT: IMU4000 F/F5, CN-BALUN (differential mode test according to ANSI C37.90., ISO 7637-4), calibration setup

IMU4000

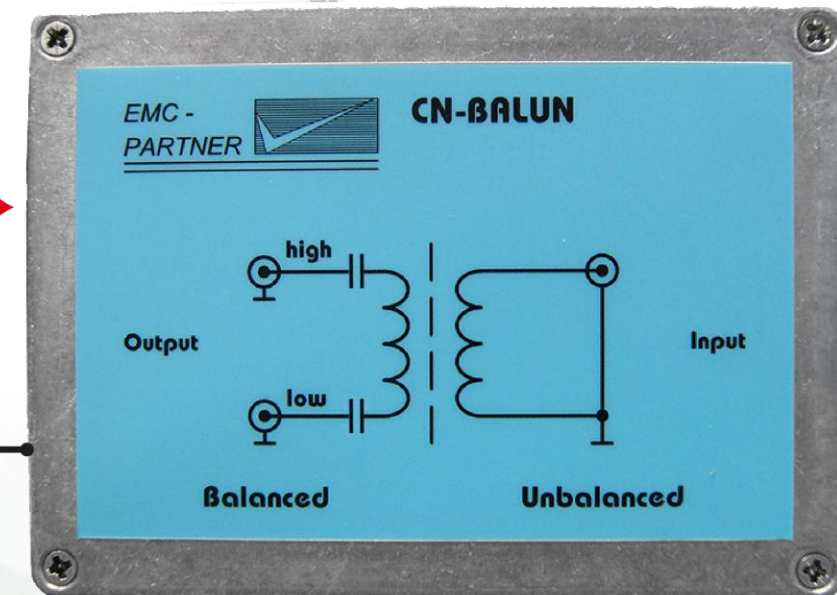


ADAPTER EFT-CDN

CN-BALUN



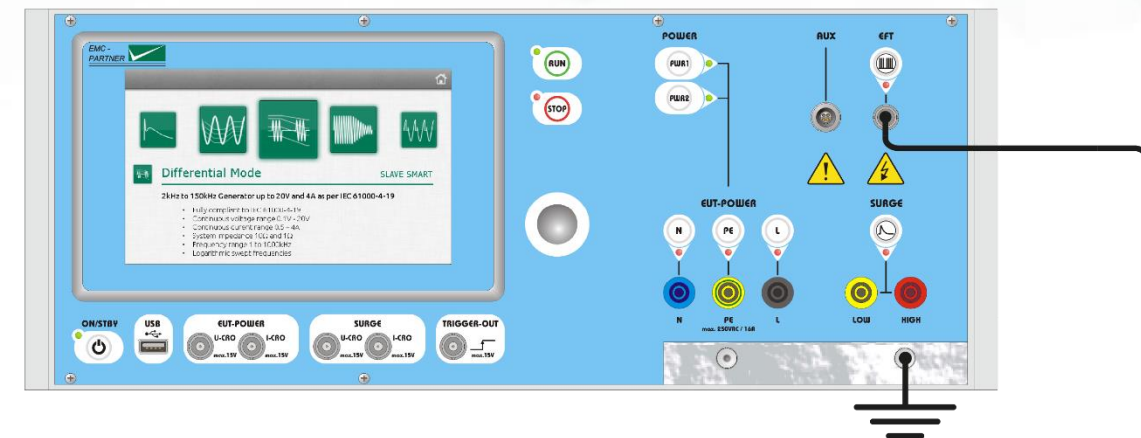
VERI50 EFT



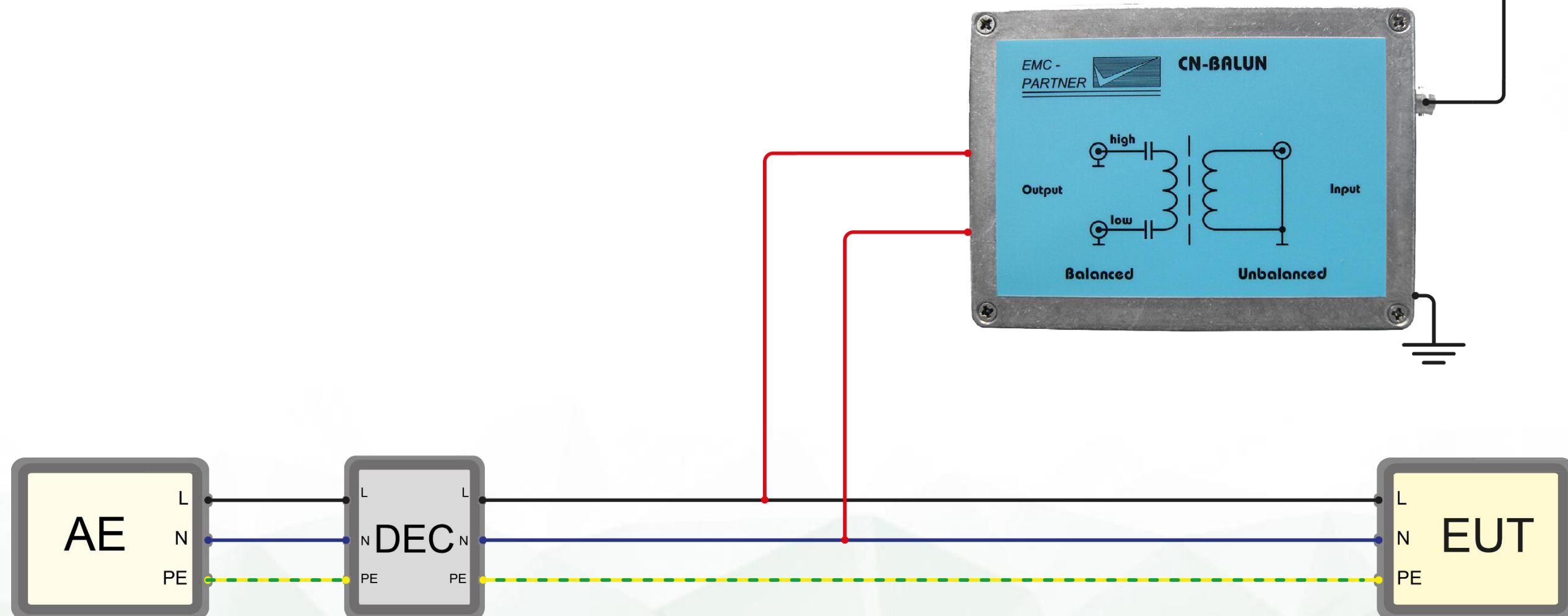
CN-BALUN is designed to apply burst in differential mode. This is not required in IEC 61000-4-2, but in ANSI C37.90 and future ISO 7637-4.

1.2.14. EFT: IMU4000 F/F5, CN-BALUN (differential mode test according to ANSIC37.90, ISO 7637-4), test setup

IMU4000



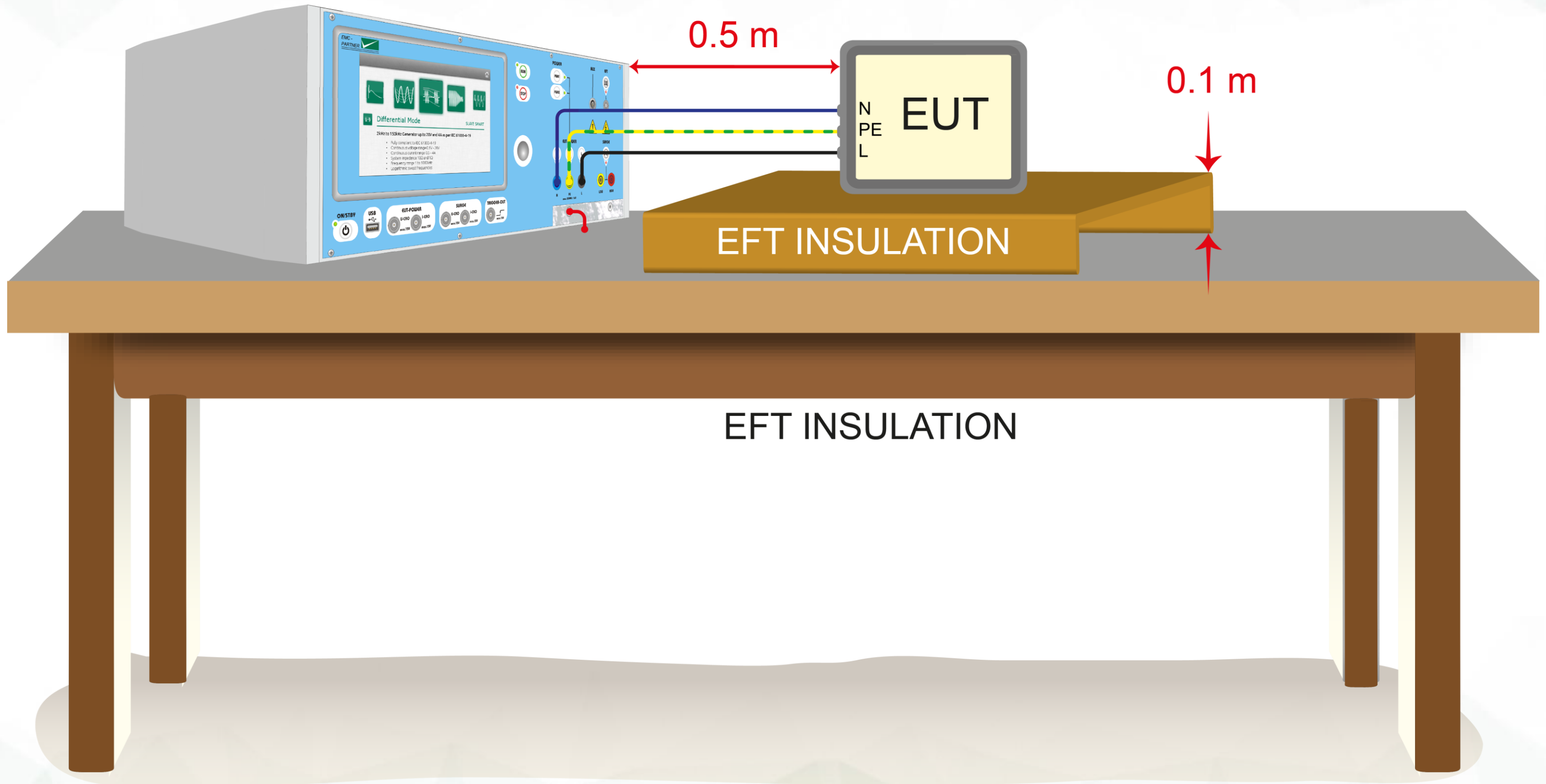
CN-BALUN



Decoupler could be a CDN like CDN2000-06-25. AE side could also be a supply.

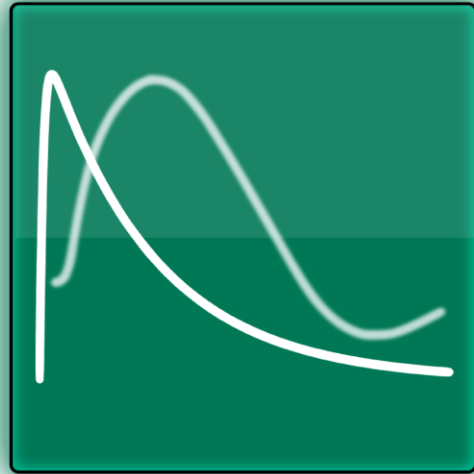
1.2.15. EFT: IMU4000 F/F5, EFT INSULATION, test setup

IMU4000



The product EFT INSULATION consists of two pieces insulation material to be placed between EUT and ground plane as per standard.

IEC 61000-4-5 Edition 3.0 / 2014

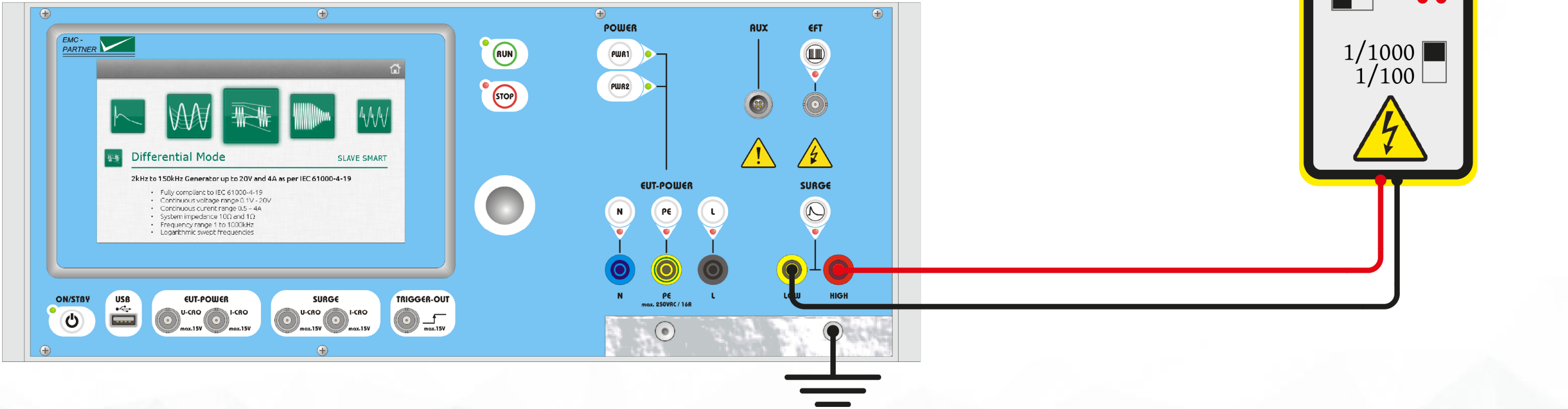


Changes from edition 2 to edition 3:

- * Mathematical formula for the pulse
- * Rationalization of impulse definition
- * Impulse definition at CDN output
- * Definition of common mode impulse
- * 10/700 μ s pulse moved to annex
- * Decoupling inductors as function of current
- * New high speed CDN proposal / alternative
- * Measurement uncertainty

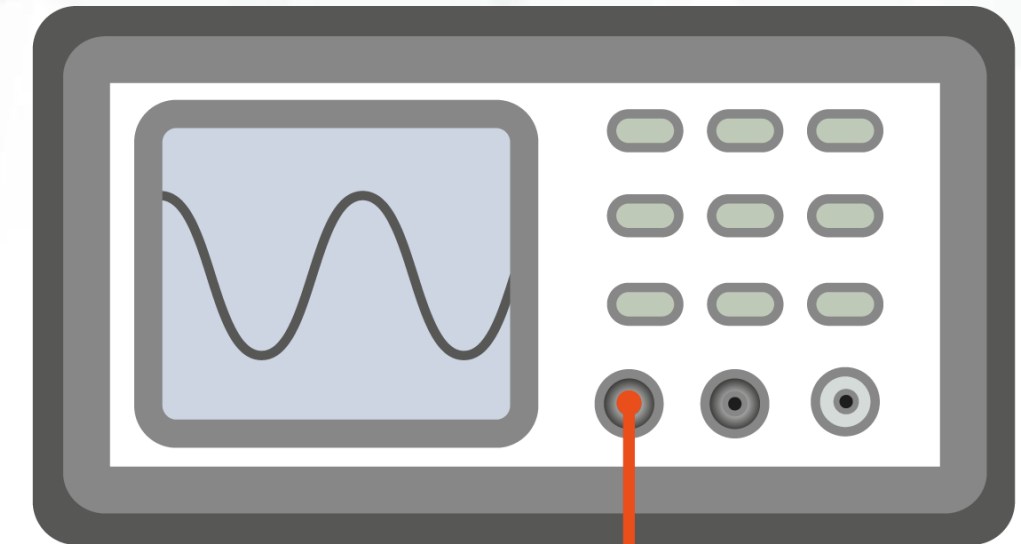
1.3.1. CWG: IMU4000 S, direct output, voltage calibration setup

IMU4000

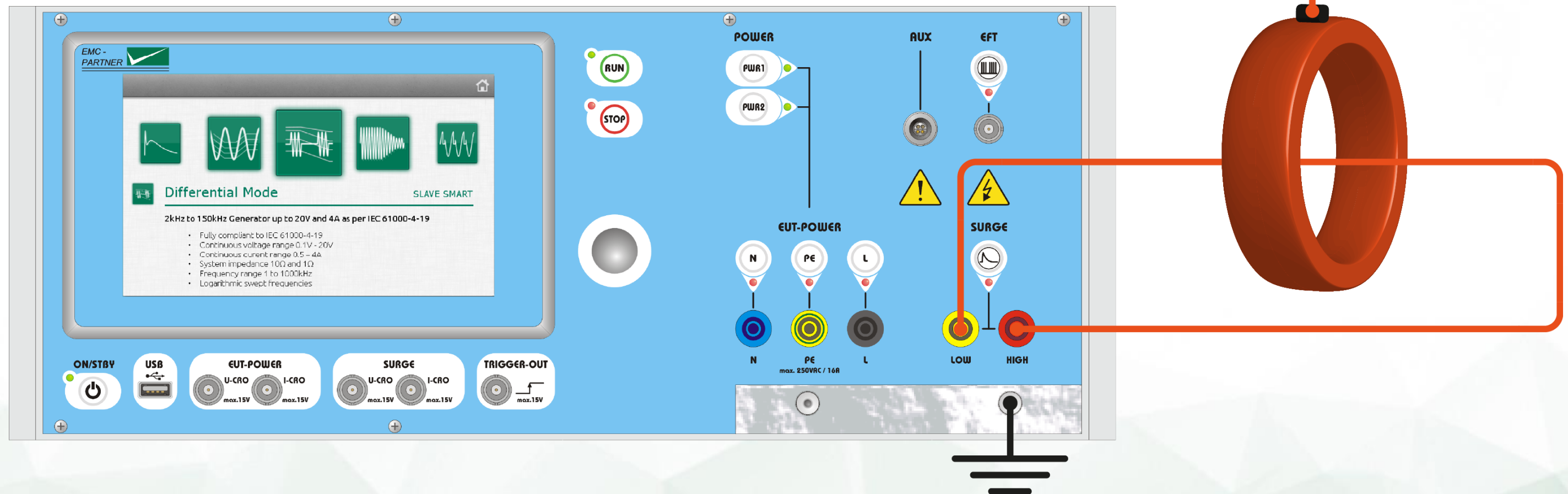


Direct output calibration does not require an additional 18 μ F capacitor, it is built-in.

1.3.2. CWG: IMU4000 S, direct output, current calibration setup

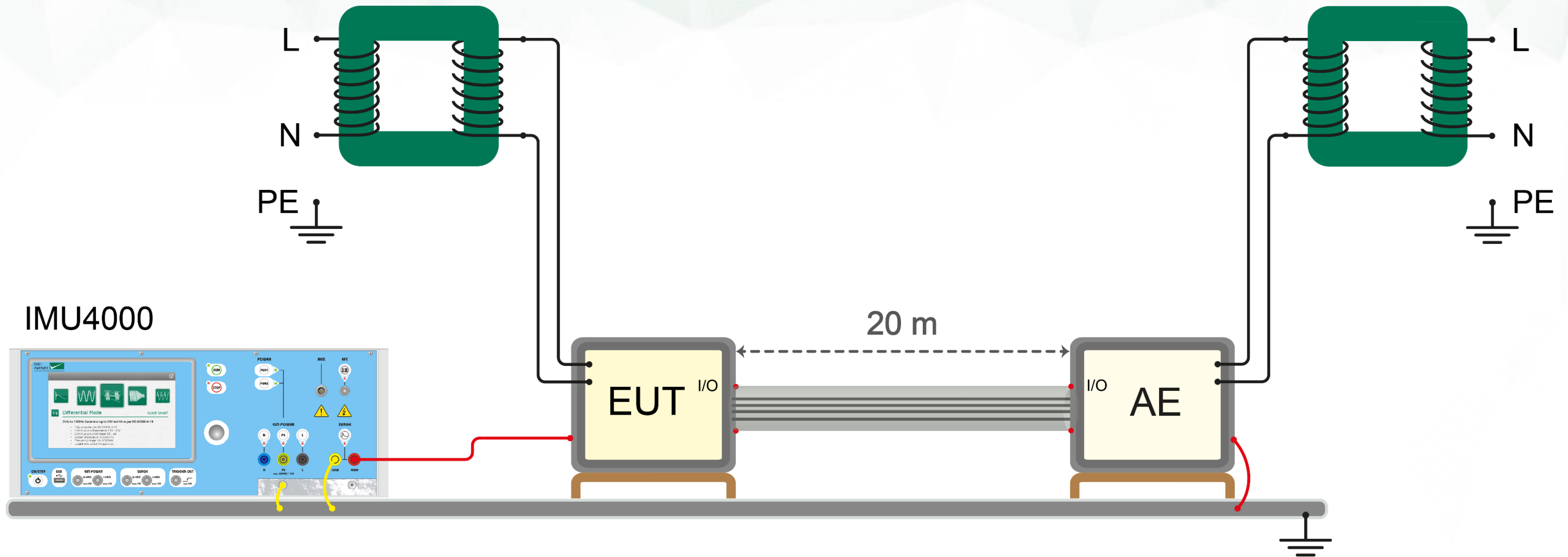


IMU4000



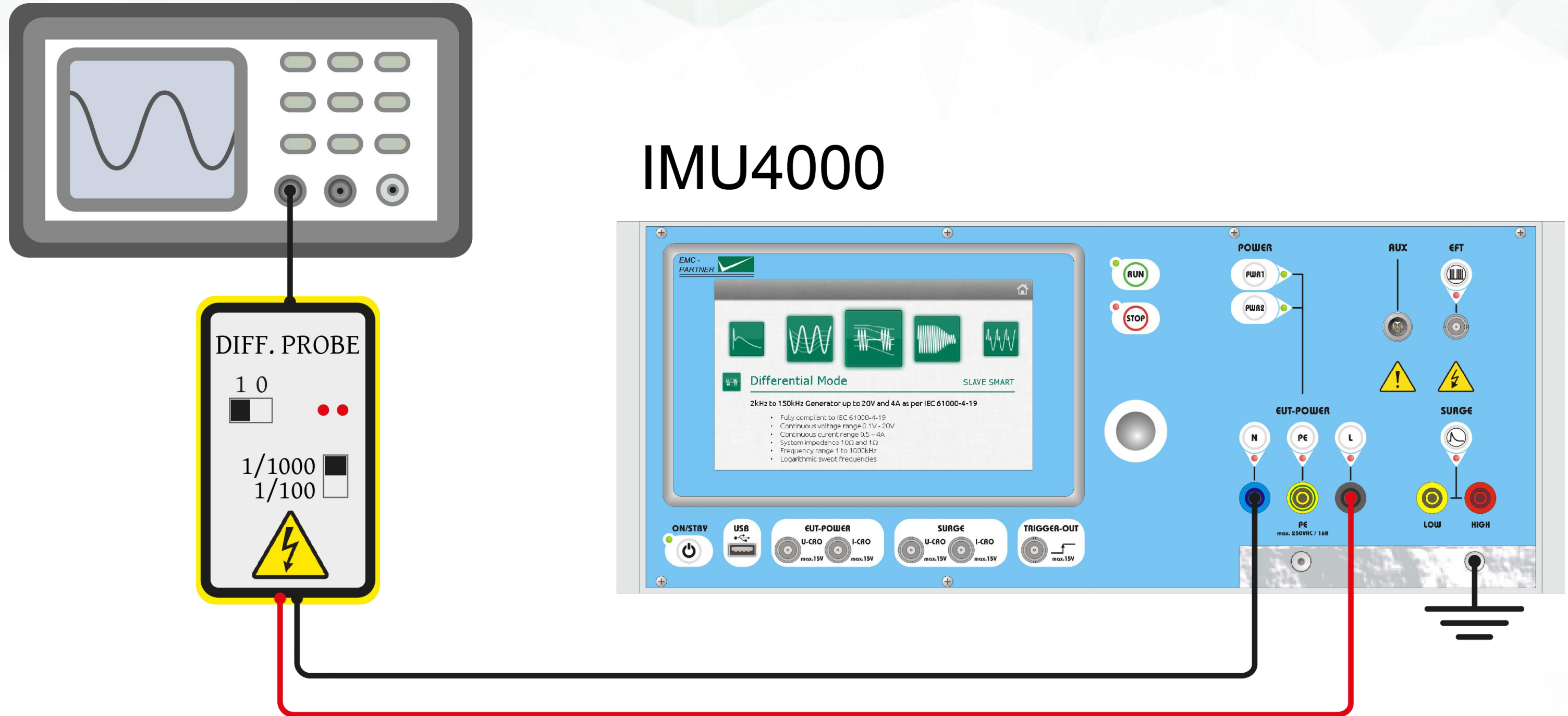
Direct output calibration does not require an additional 18 μ F capacitor, it is built-in.

1.3.3. CWG: IMU4000 S, direct output, test setup example: test on shielded I/O lines



Shielded lines do not require a CDN for surge test, direct output is utilized. Supply of EUT and AE must be decoupled through transformers.

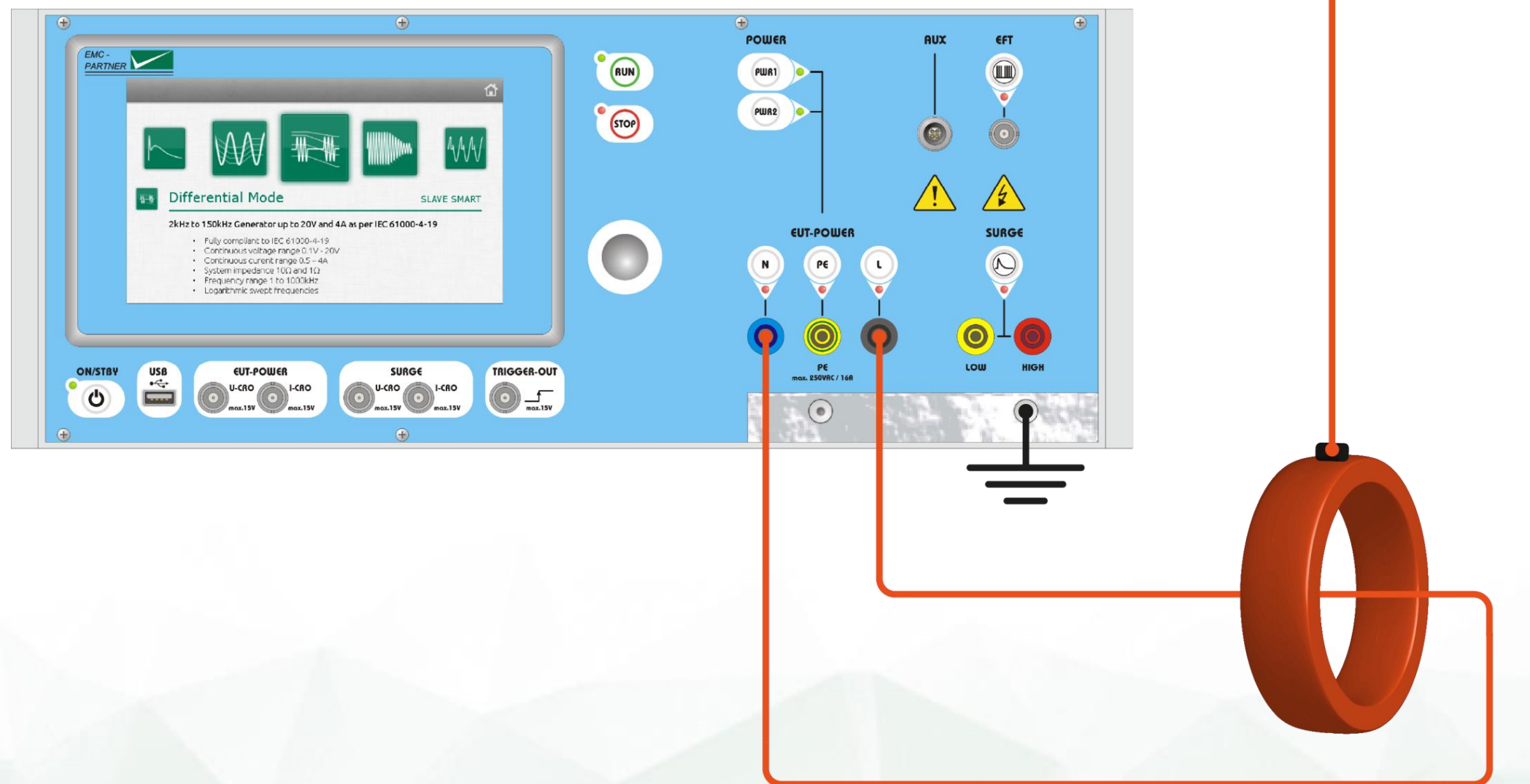
1.3.4. CWG: IMU4000 S, internal CDN, voltage calibration setup



All coupling paths are calibrated successively.

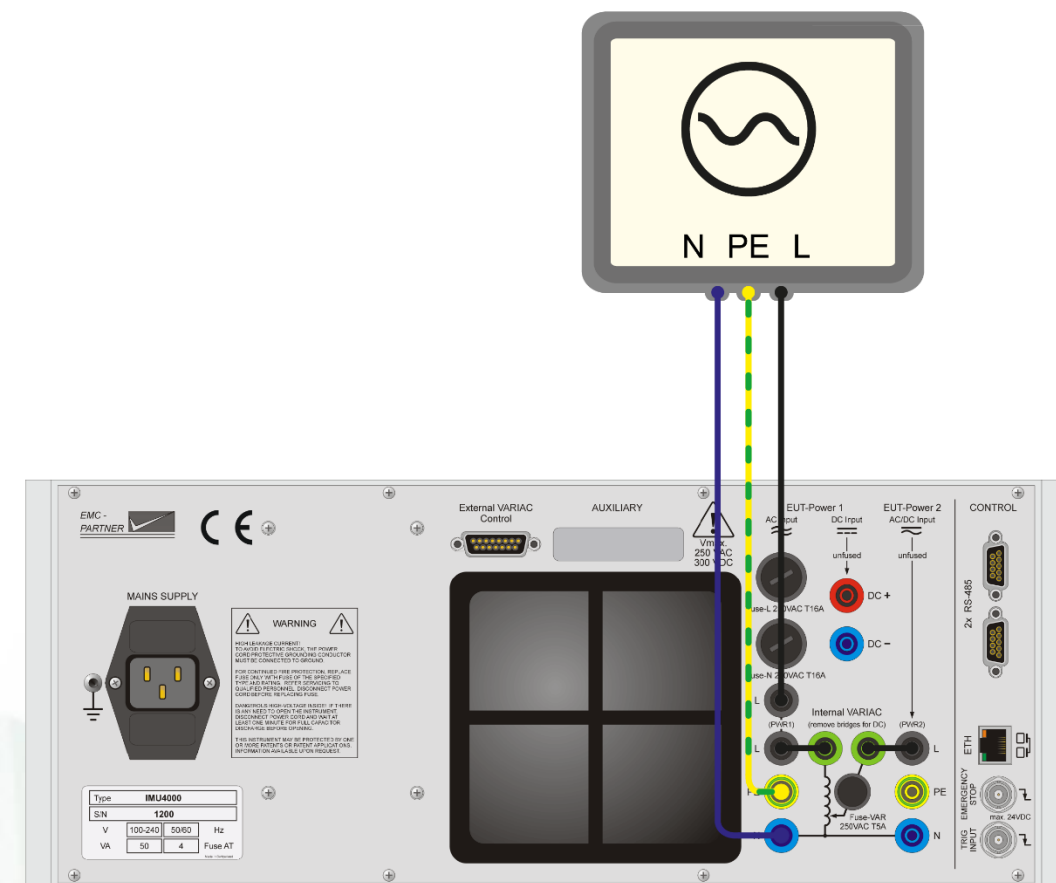
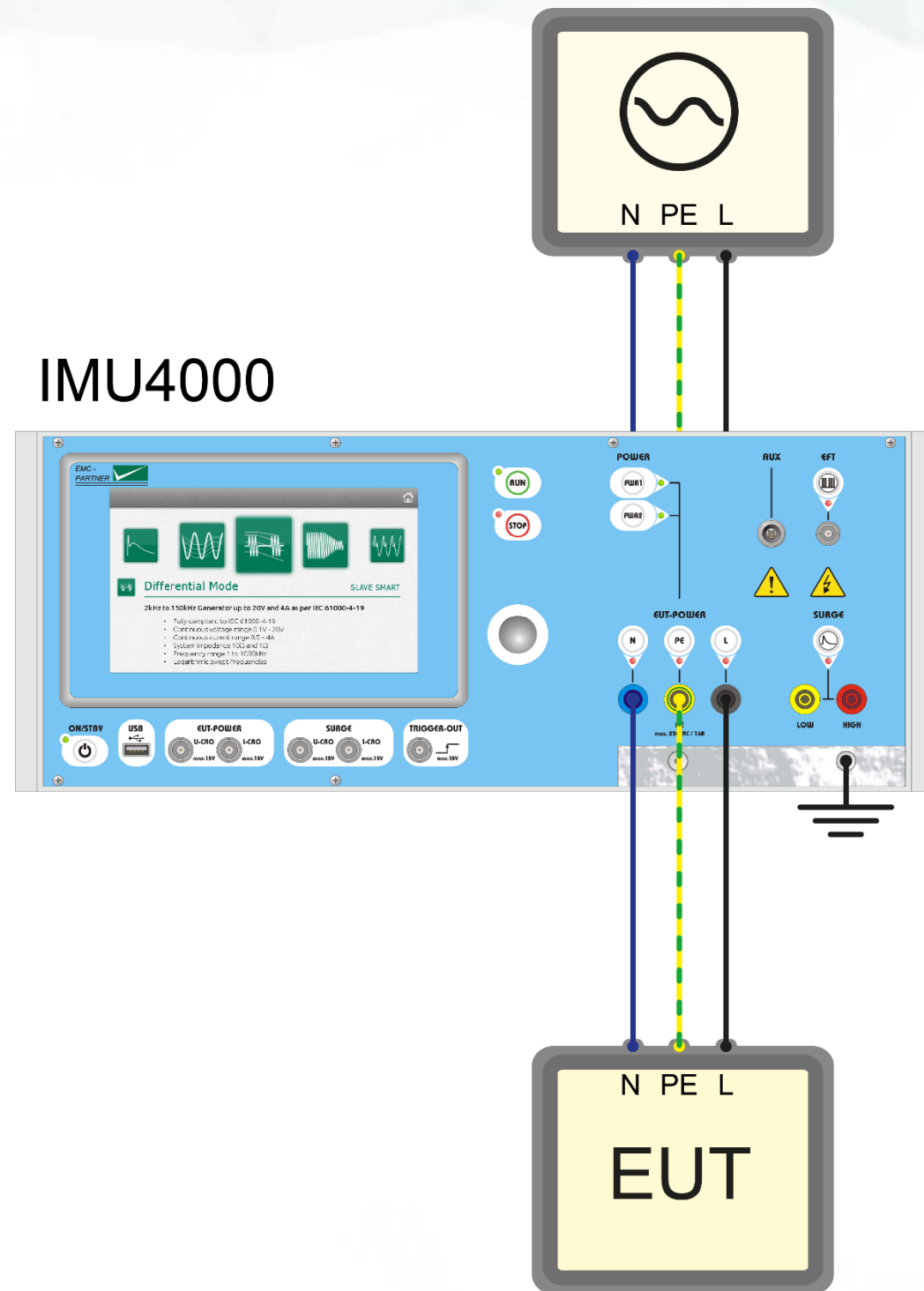
1.3.5. CWG: IMU4000 S, internal CDN, current calibration setup

IMU4000



All coupling paths are calibrated successively.

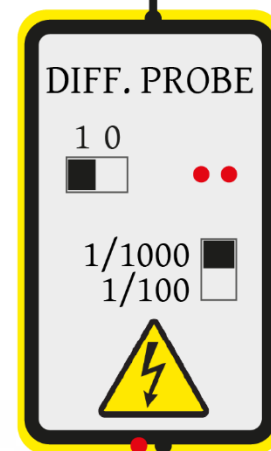
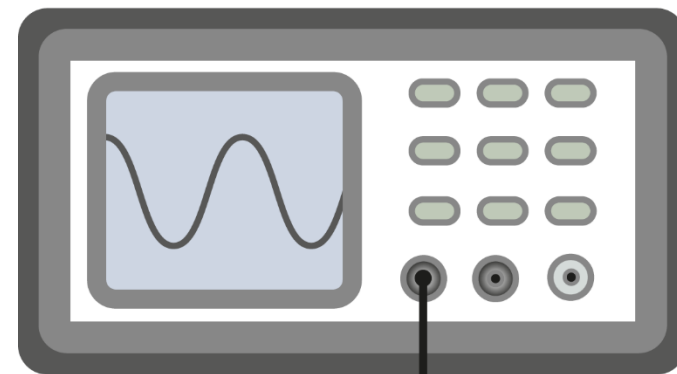
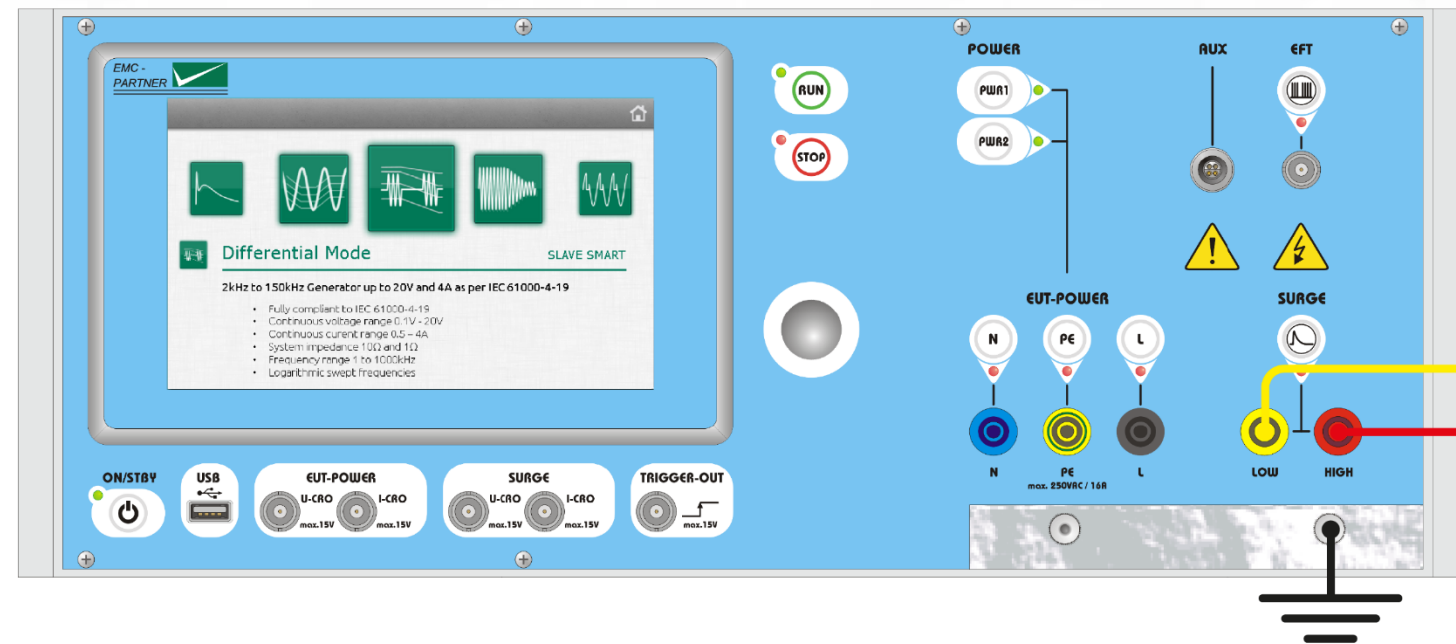
1.3.6. CWG: IMU4000 S, internal CDN, test setup



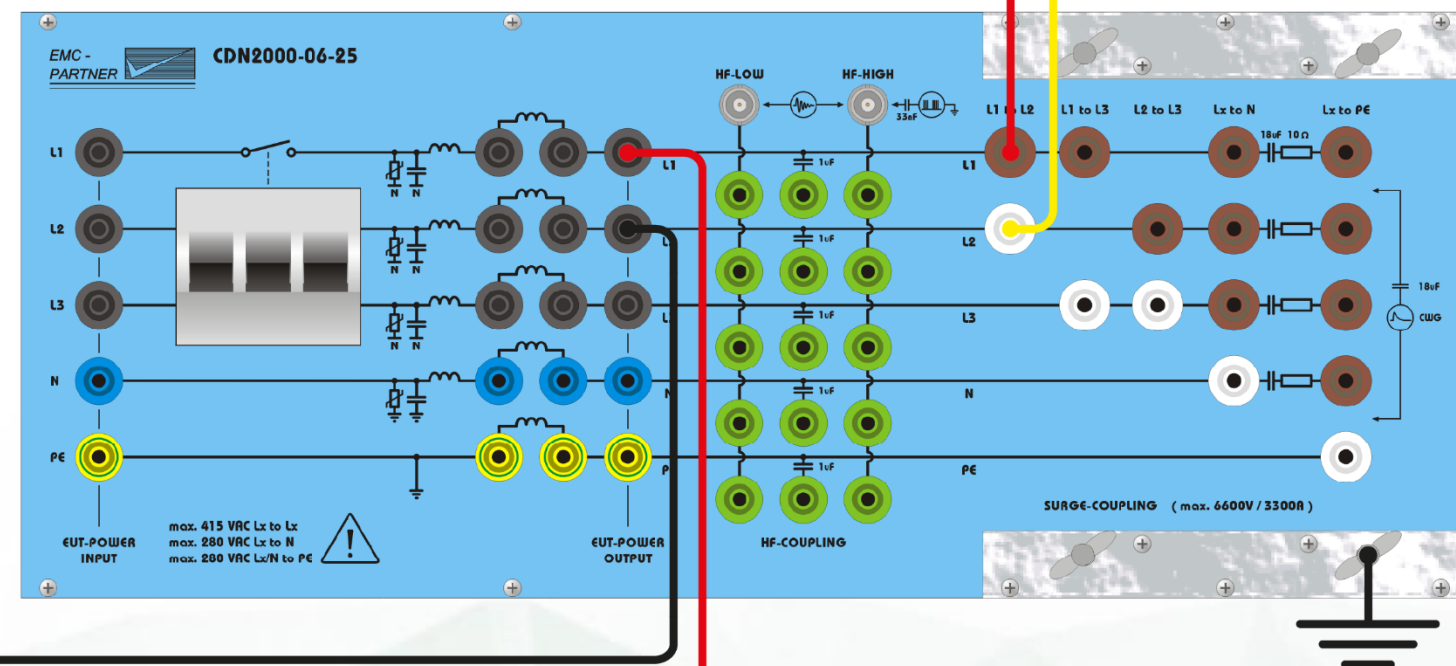
Internal CDN has built-in protection fuses on both L and N lines (16A), and Peak Check function can be used additionally.

1.3.7. CWG: IMU4000 S, CDN2000-06-25 (or any three phase manual CDN), voltage calibration setup

IMU4000



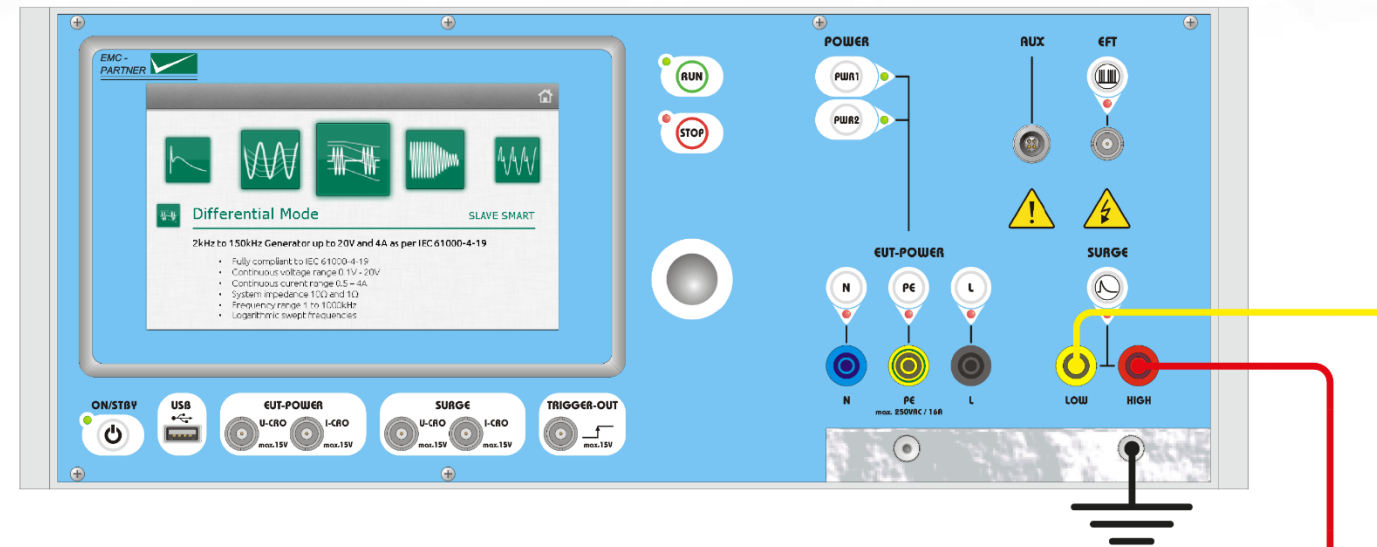
CDN2000-06-25



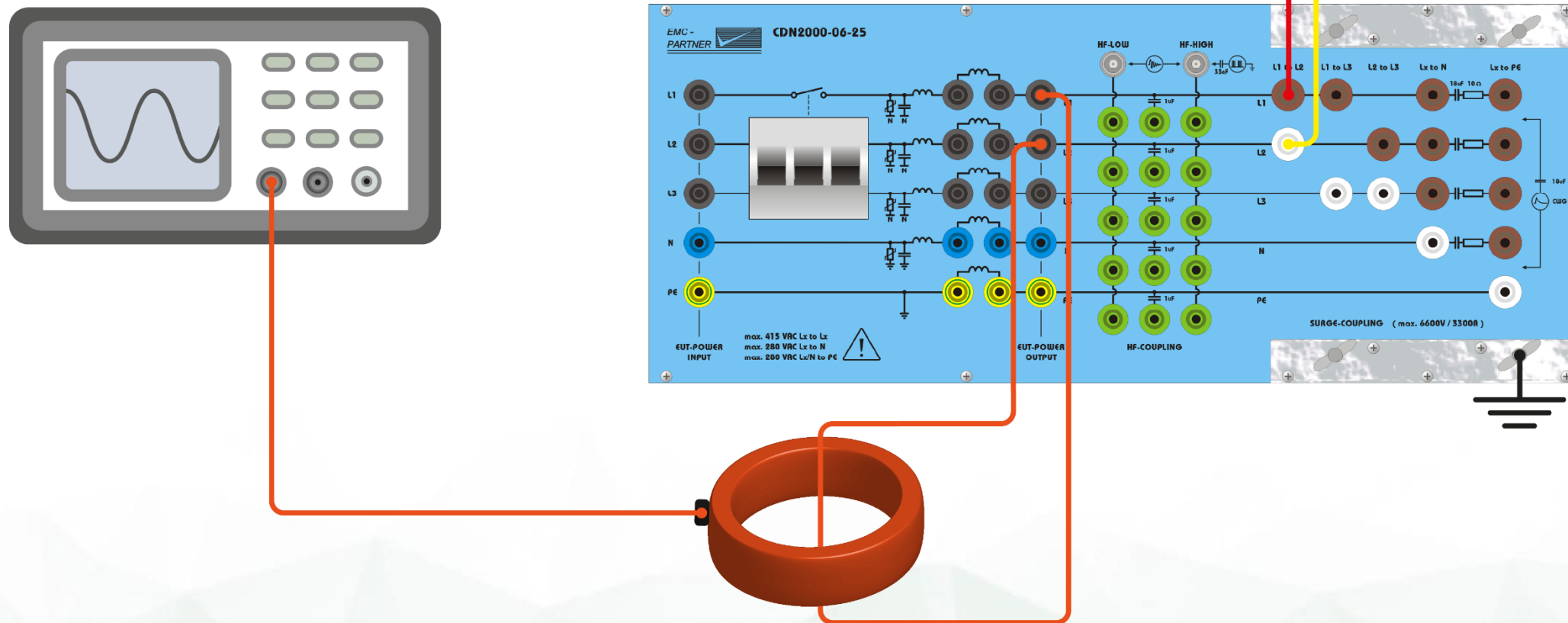
All coupling paths are calibrated successively.

1.3.8. CWG: IMU4000 S, CDN2000-06-25 (or any three phase manual CDN), current calibration setup

IMU4000



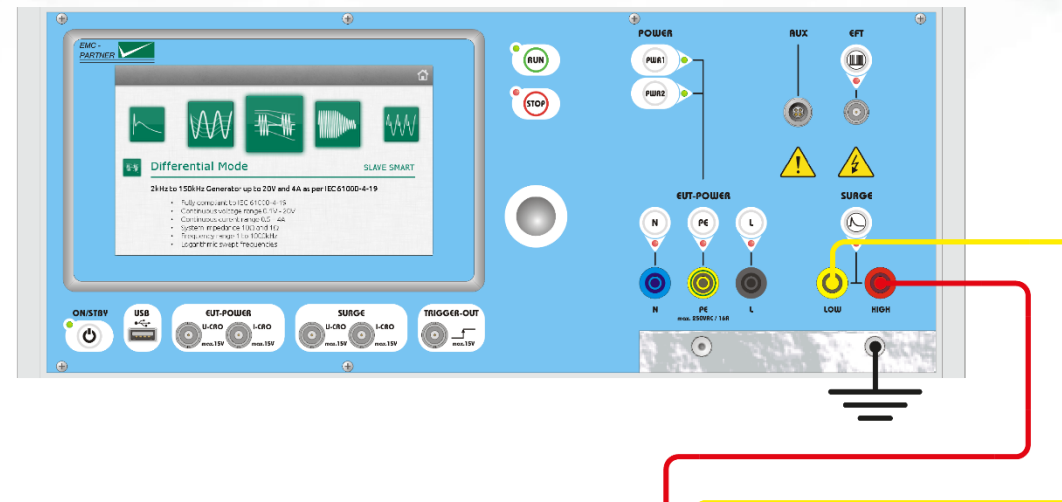
CDN2000-06-25



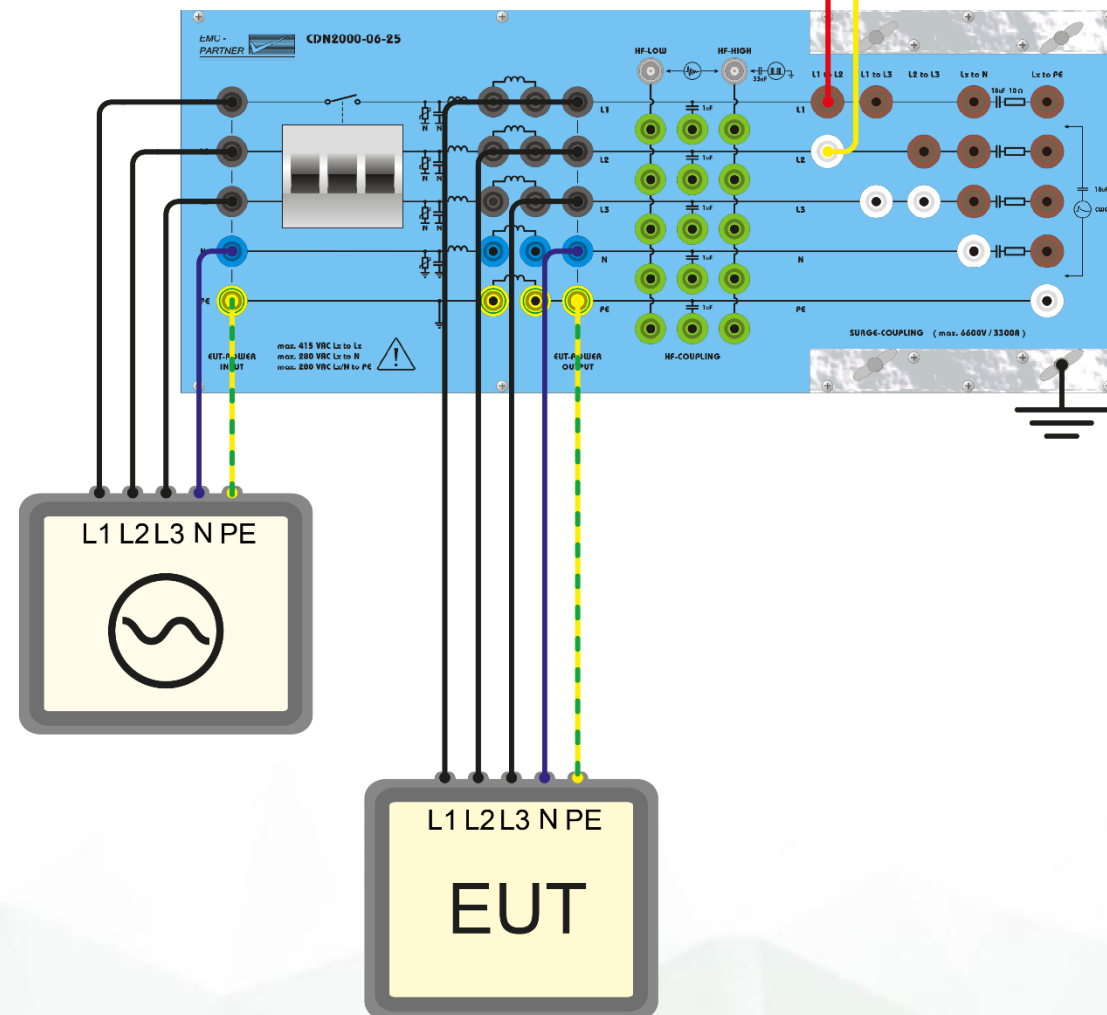
All coupling paths are calibrated successively.

1.3.9. CWG: IMU4000 S, CDN2000-06-25 (or any three phase manual CDN), test setup

IMU4000



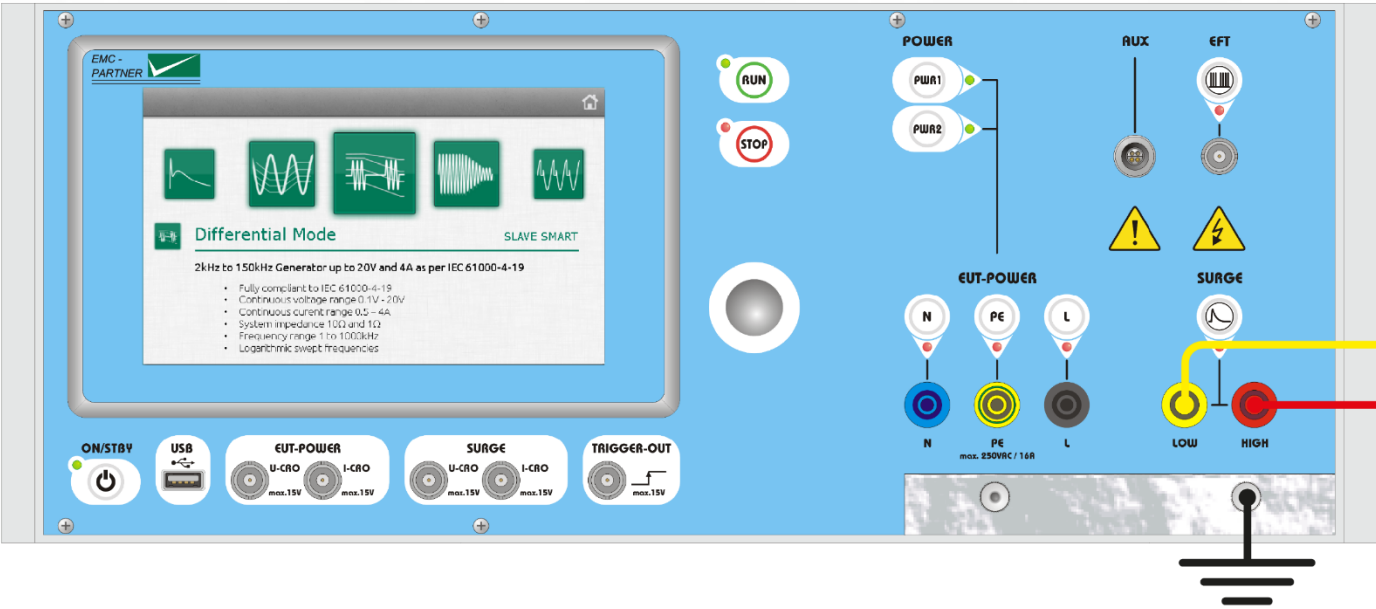
CDN2000-06-25



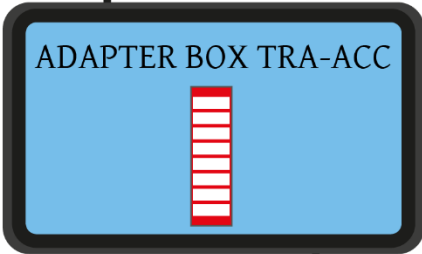
All EMC Partner external CDNs for supply lines have built-in automatic fuses.

1.3.10. CWG: IMU4000 S, CDN3000A-06-32 (or any three phase automatic CDN 32 A and 63A), voltage calibration setup

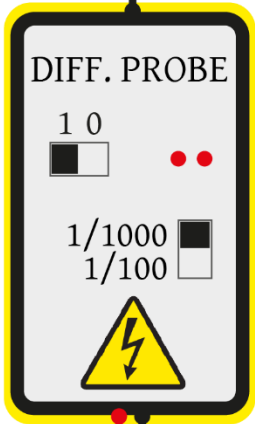
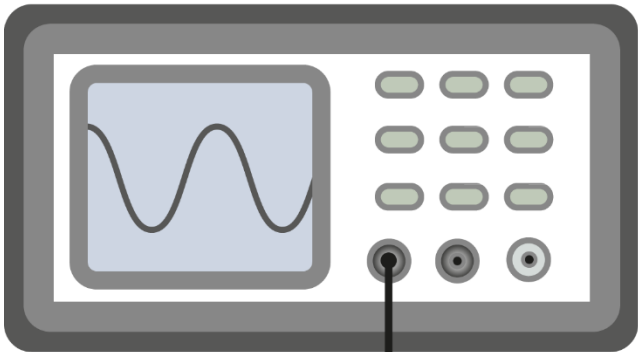
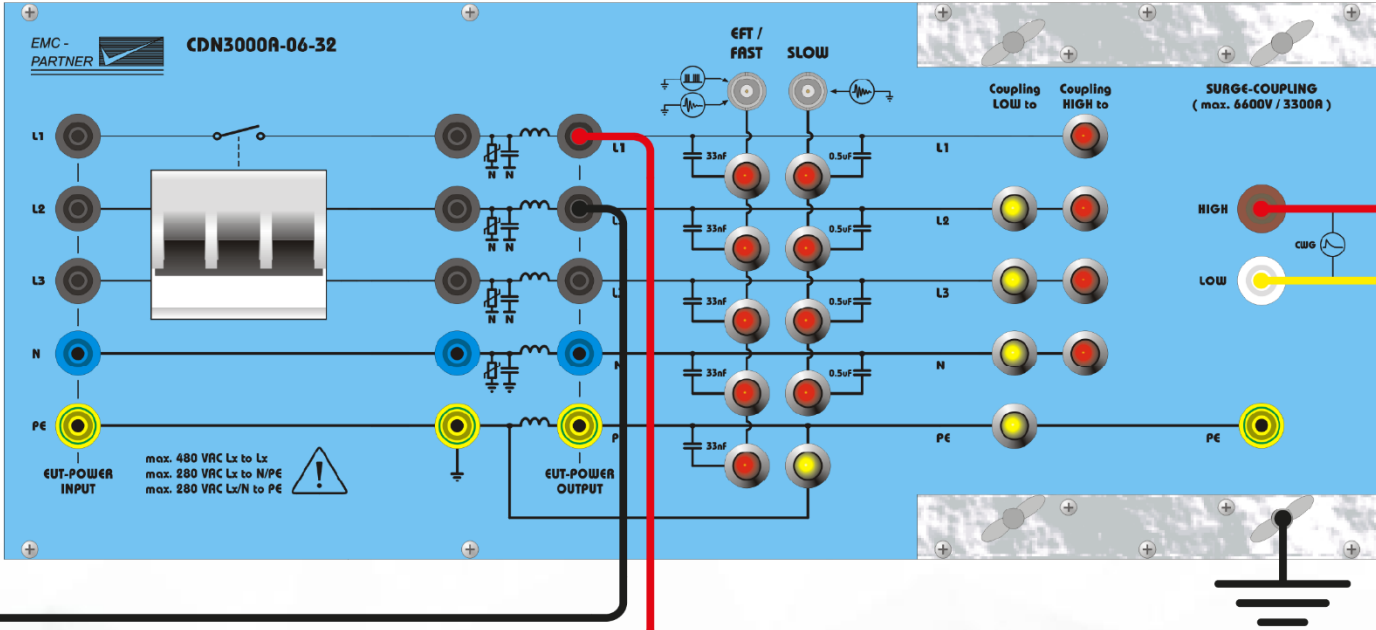
IMU4000



TRA-ACC



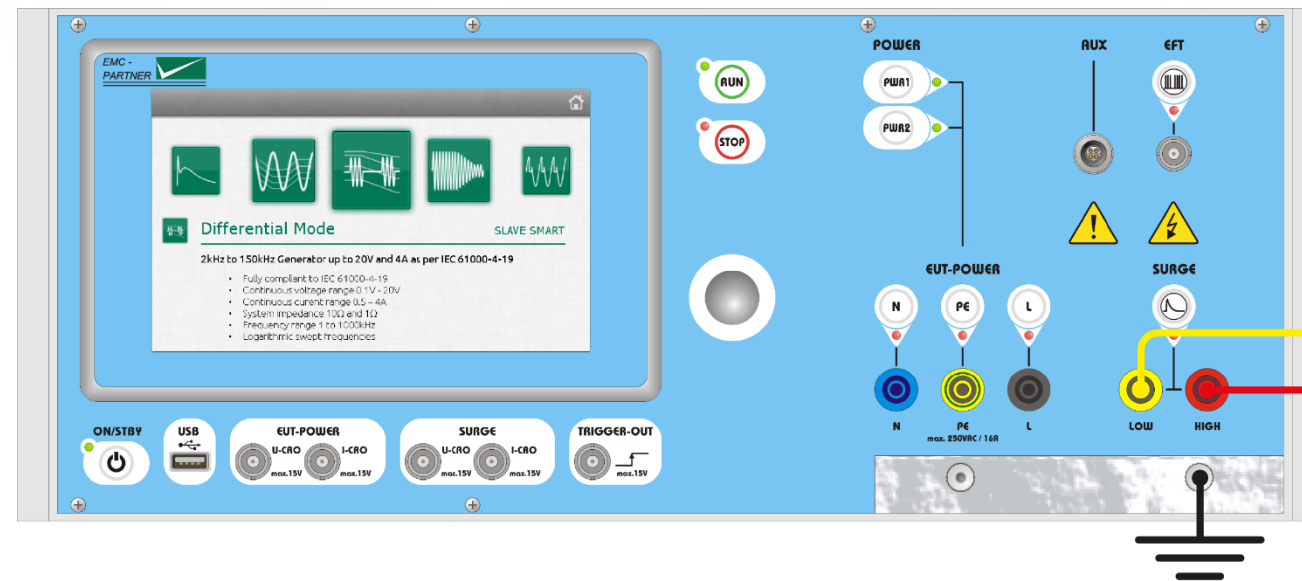
CDN3000A-06-32



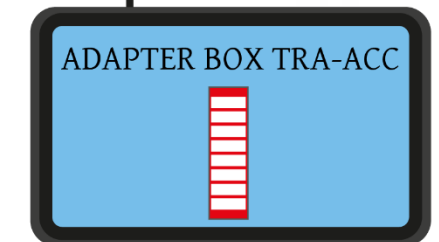
All coupling paths are calibrated successively.

1.3.11. CWG: IMU4000 S, CDN3000A-06-32 (or any three phase automatic CDN 32A and 63 A), current calibration setup

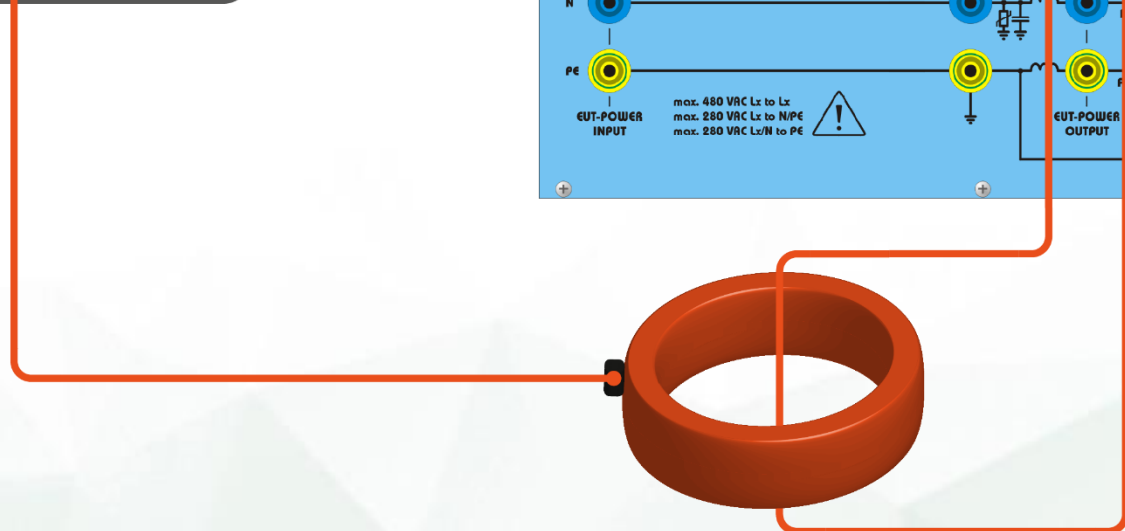
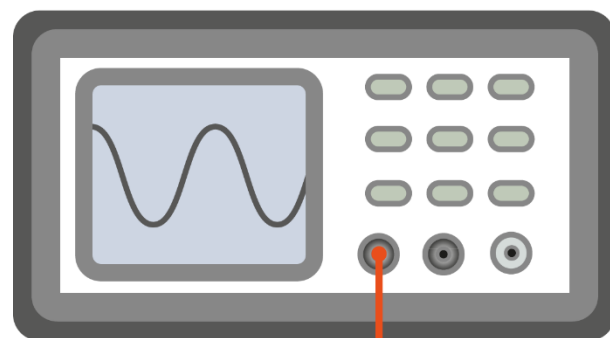
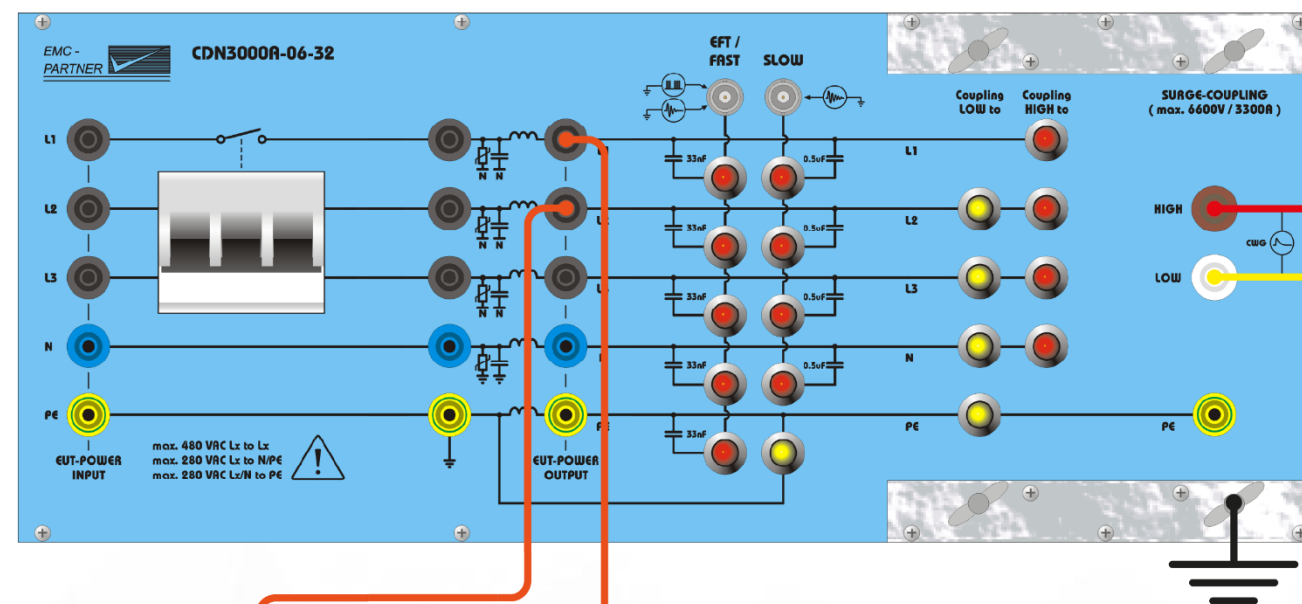
IMU4000



TRA-ACC

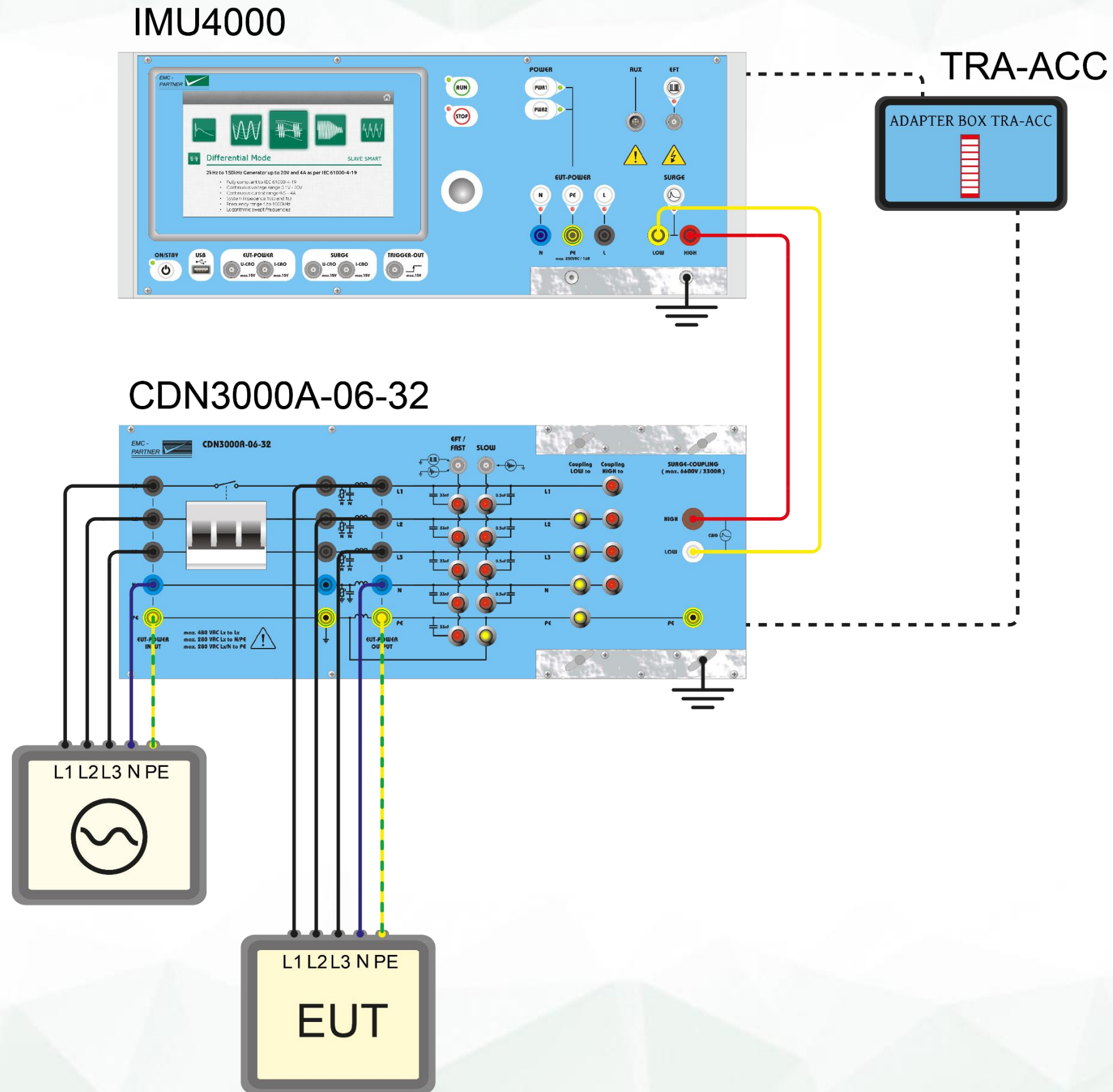


CDN3000A-06-32



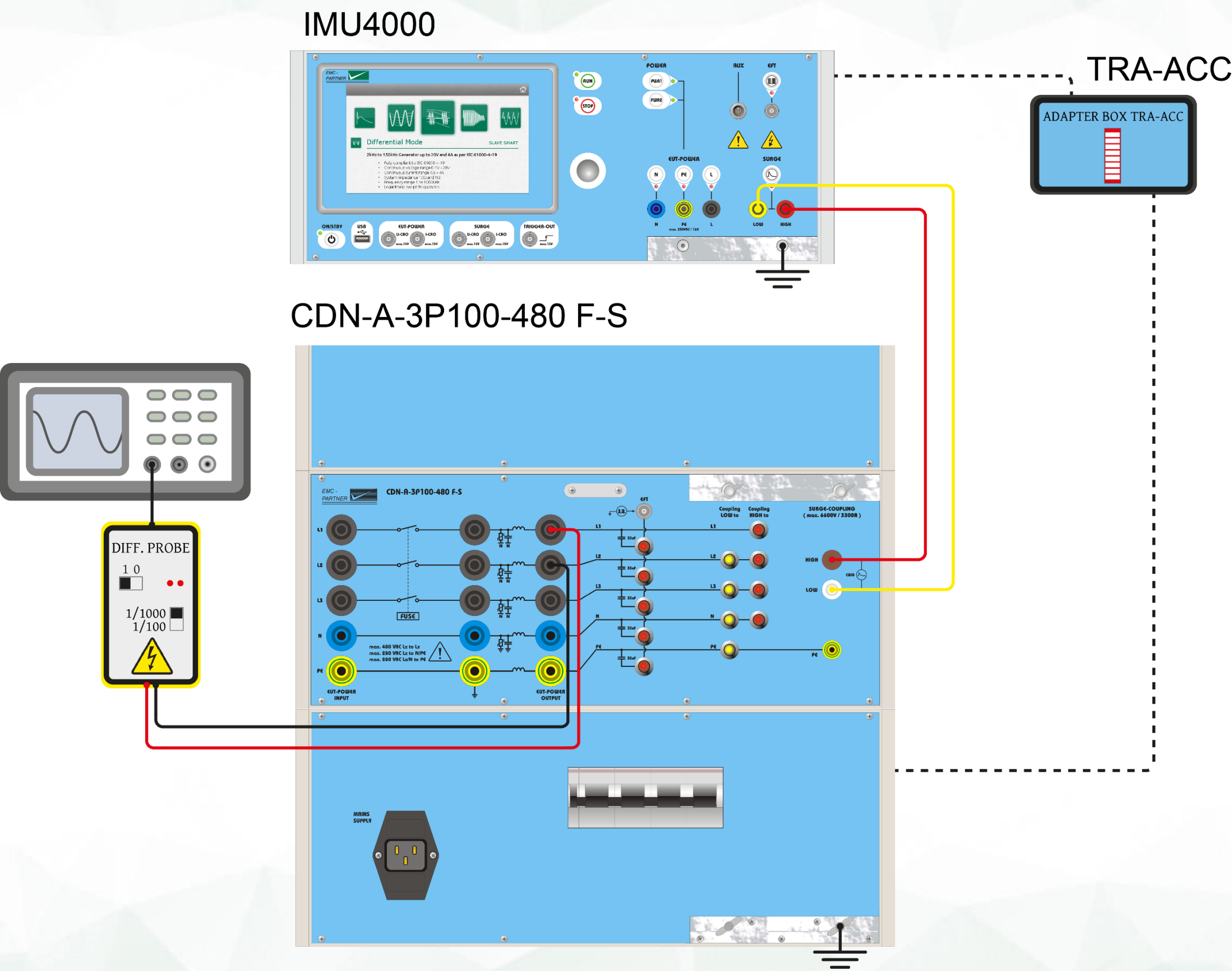
All coupling paths are calibrated successively.

1.3.12. CWG: IMU4000 S, CDN3000A-06-32 (or any three phase automatic CDN 32A and 63 A), test setup



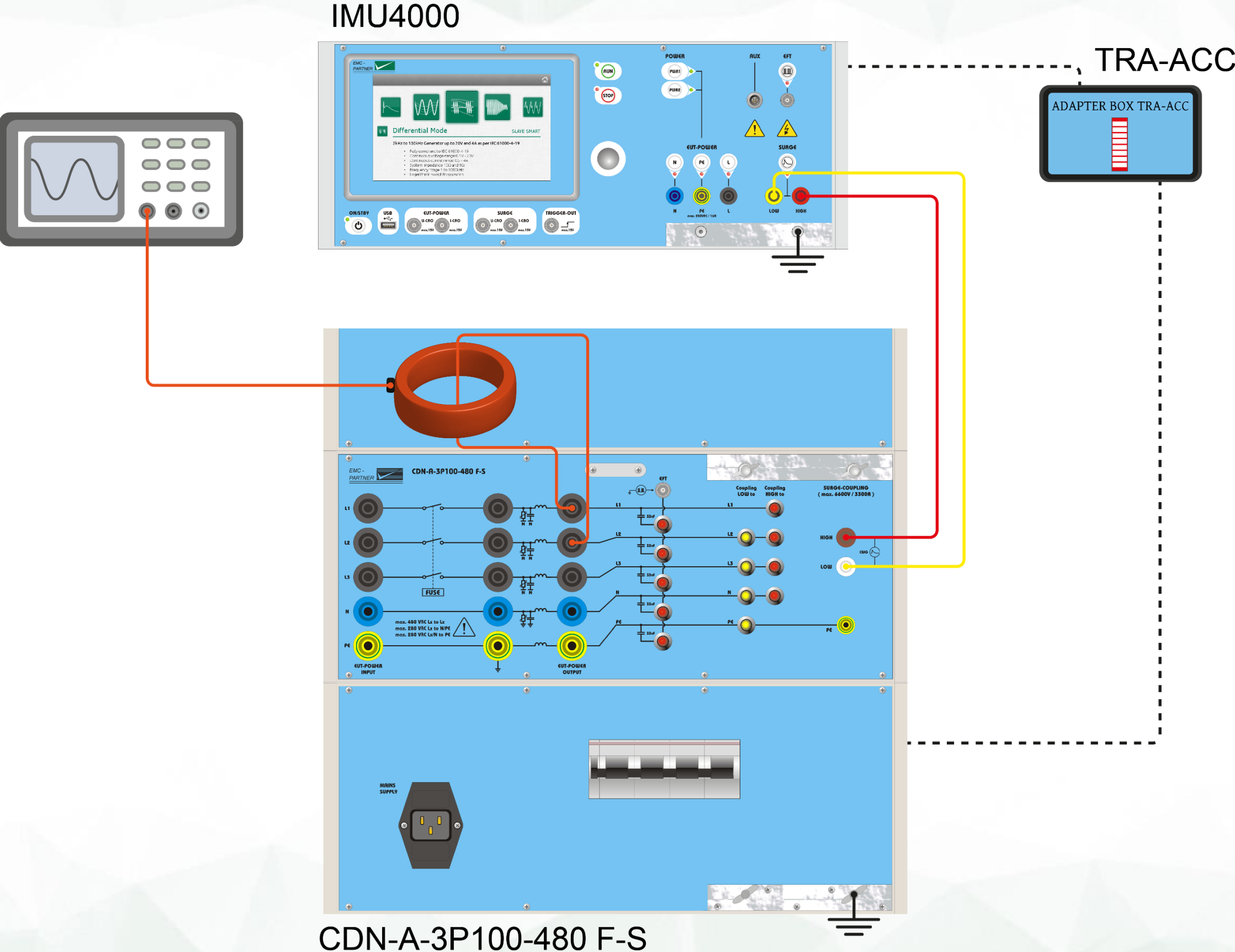
All EMC Partner external CDNs for supply lines have built-in automatic fuses.

1.3.13. CWG: IMU4000 S, CDN-A-3P100-480 F-S (also 690V version), voltage calibration setup



All coupling paths are calibrated successively.

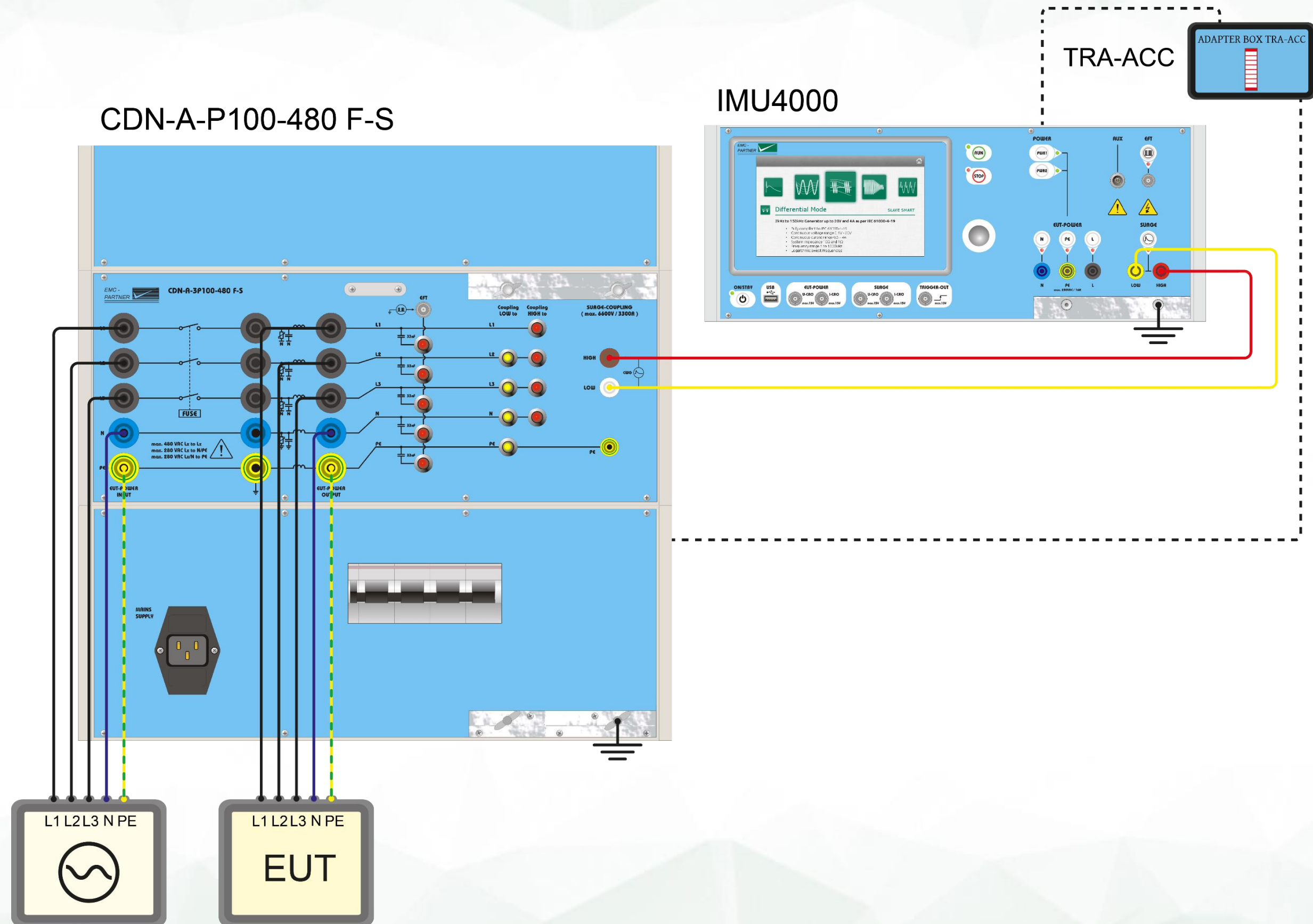
1.3.14. CWG: IMU4000 S, CDN-A-3P100-480 F-S (also 690V version), current calibration setup



CDN-A-3P100-480 F-S

All coupling paths are calibrated successively.

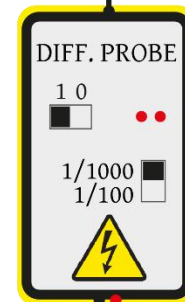
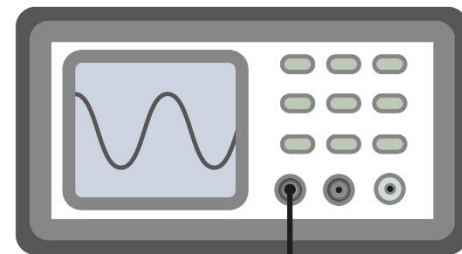
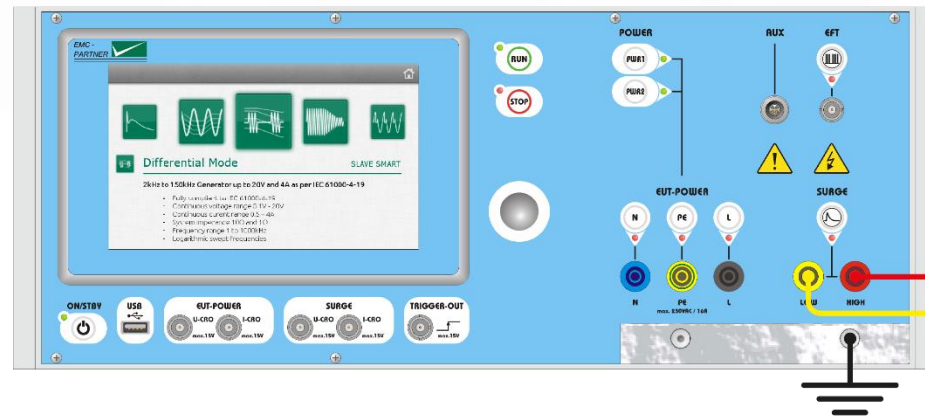
1.3.15. CWG: IMU4000 S, CDN-A-3P100-480 F-S (also 690V version), test setup



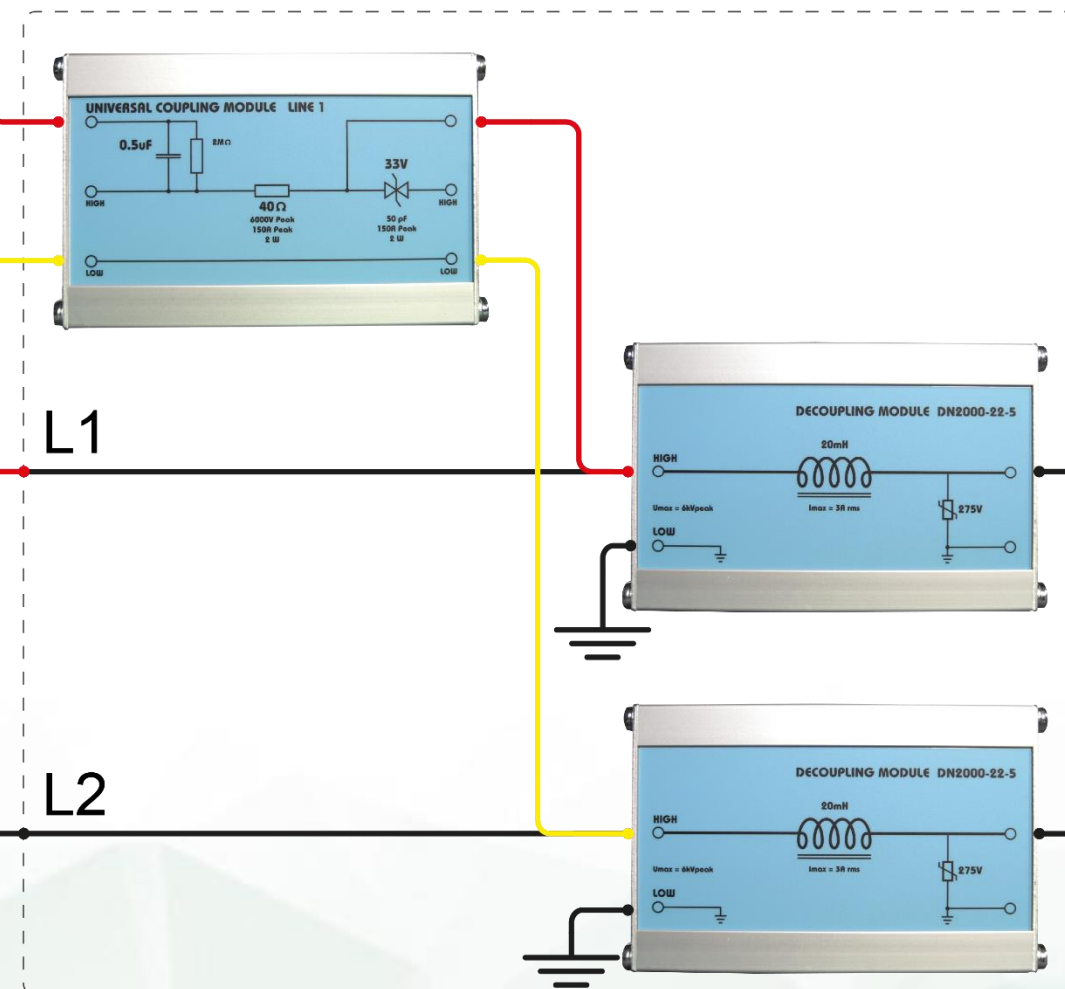
All EMC Partner external CDNs for supply lines have built-in automatic fuses.

1.3.16. CWG: IMU4000 S, CDN-KIT1000 ED3, voltage calibration setup

IMU4000



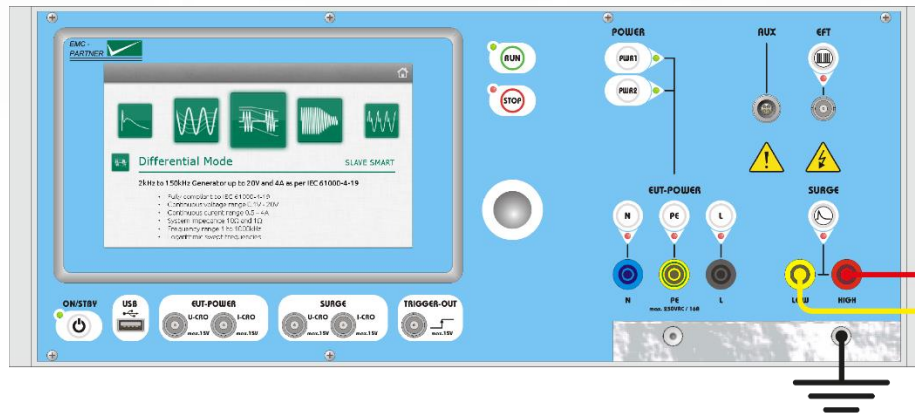
CDN-KIT1000 ED3



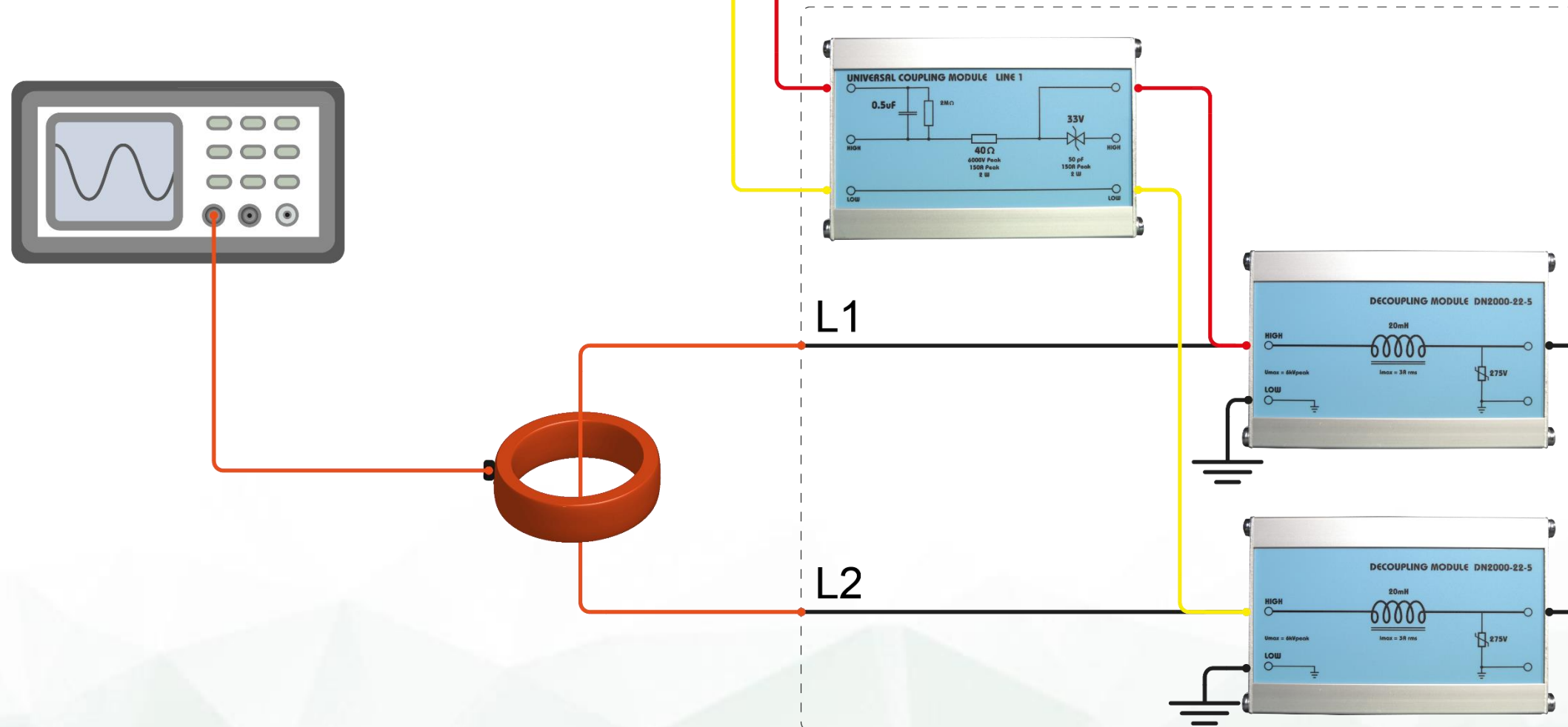
All coupling paths are calibrated successively, L1-L2, L1-Gnd, L2-Gnd.

1.3.17. CWG: IMU4000 S, CDN-KIT1000 ED3, current calibration setup

IMU4000



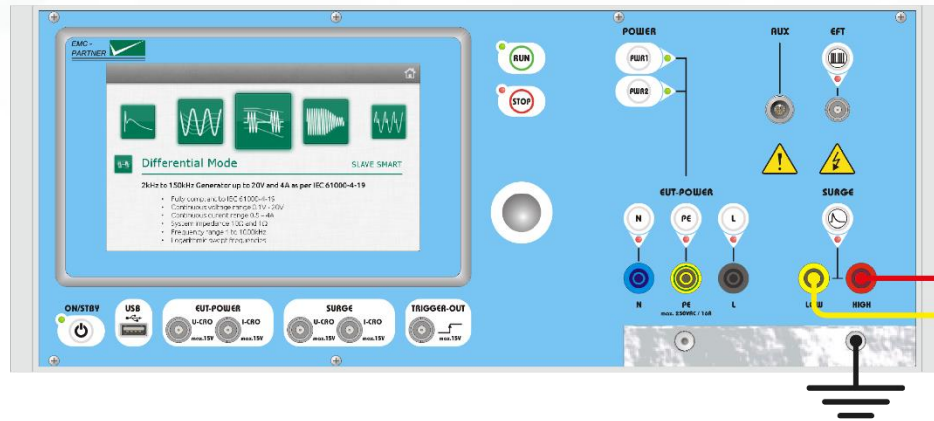
CDN-KIT1000 ED3



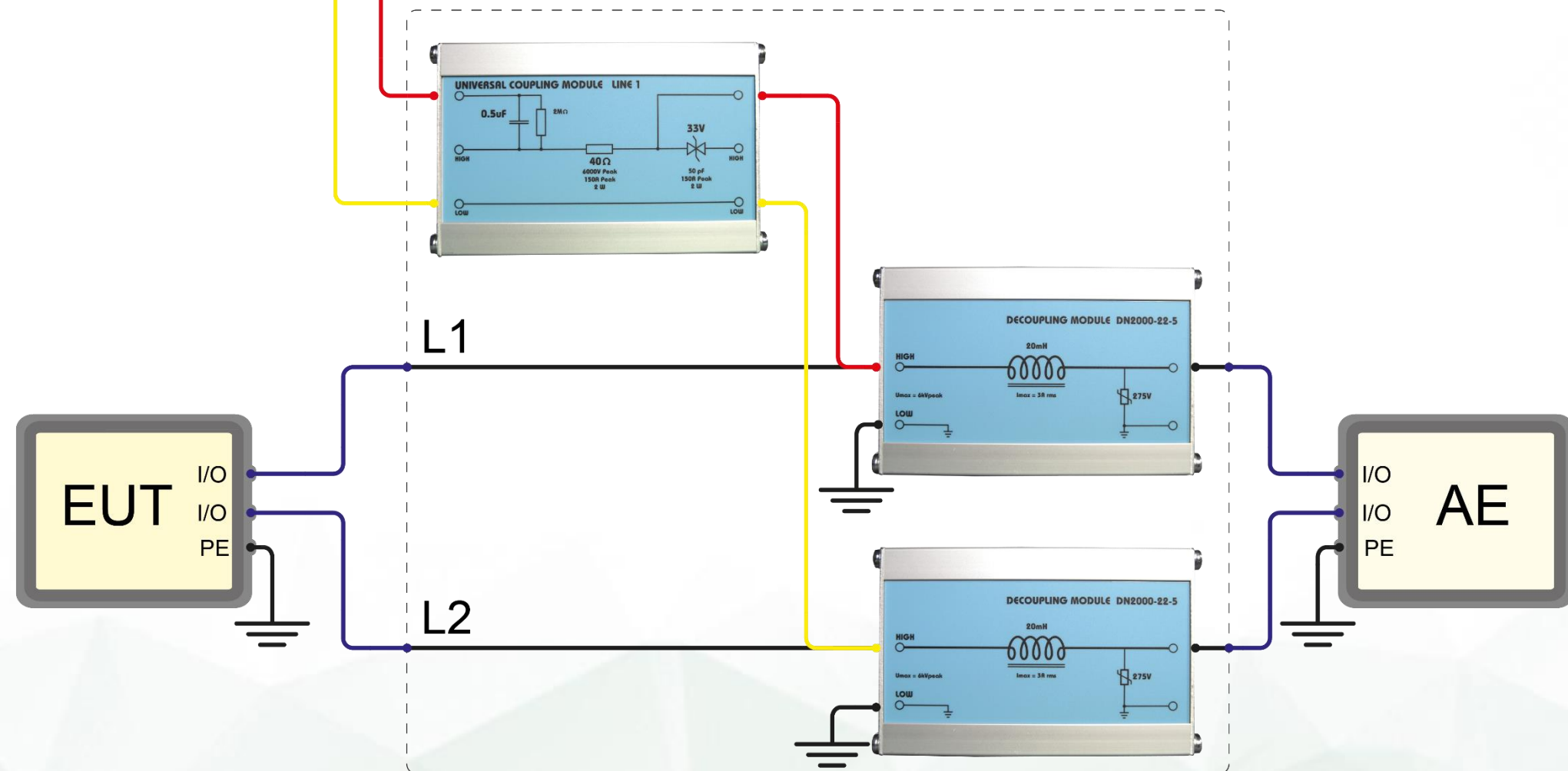
All coupling paths are calibrated successively, L1-L2, L1-Gnd, L2-Gnd.

1.3.18. CWG: IMU4000 S, CDN-KIT1000 ED3, test setup

IMU4000



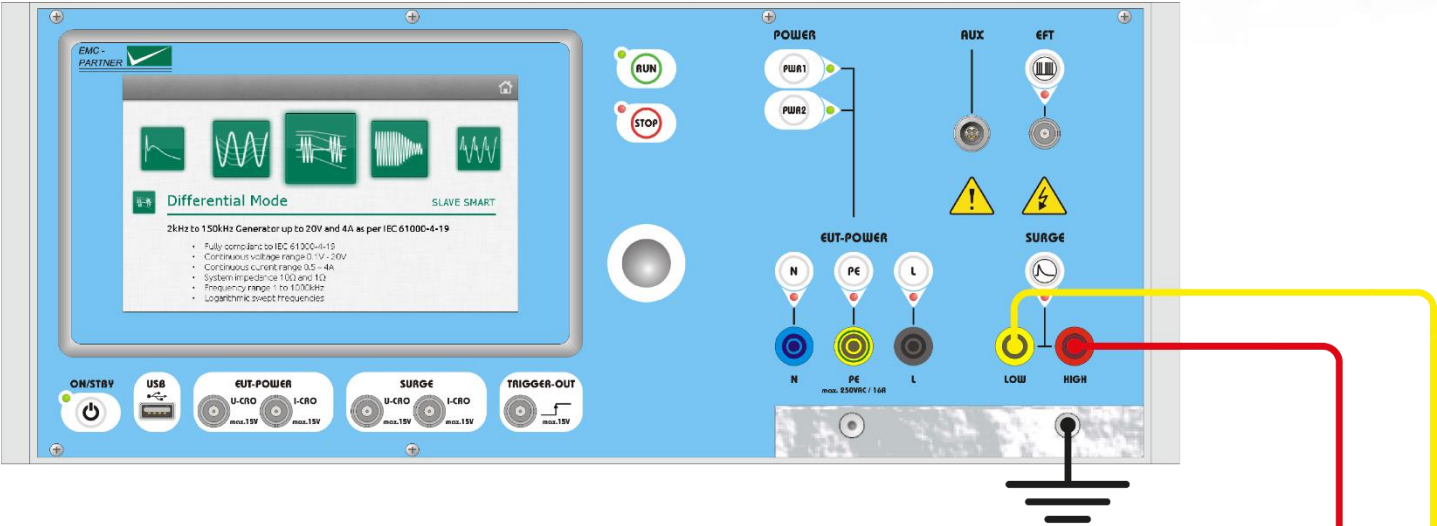
CDN-KIT1000 ED3



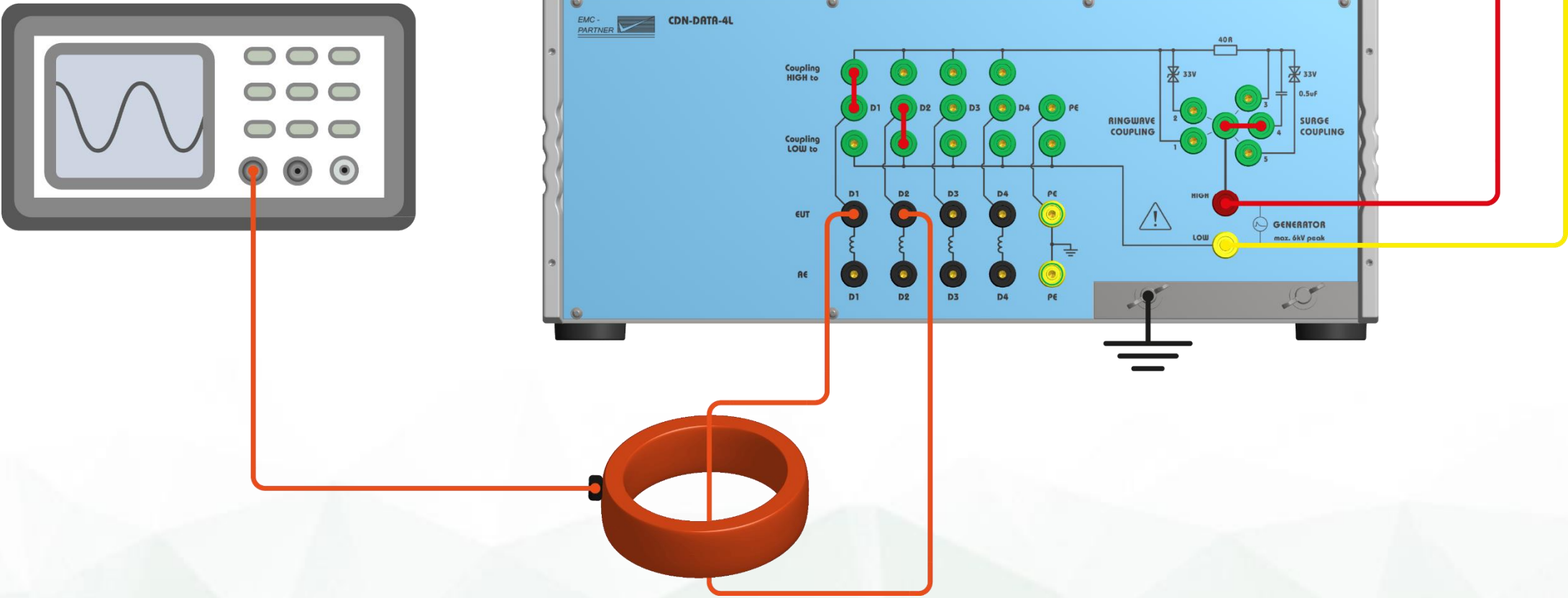
Coupling element can be selected: capacitor or bipolar diode.

1.3.20. CWG: IMU4000 S, CDN-DATA-4L, current calibration setup

IMU4000



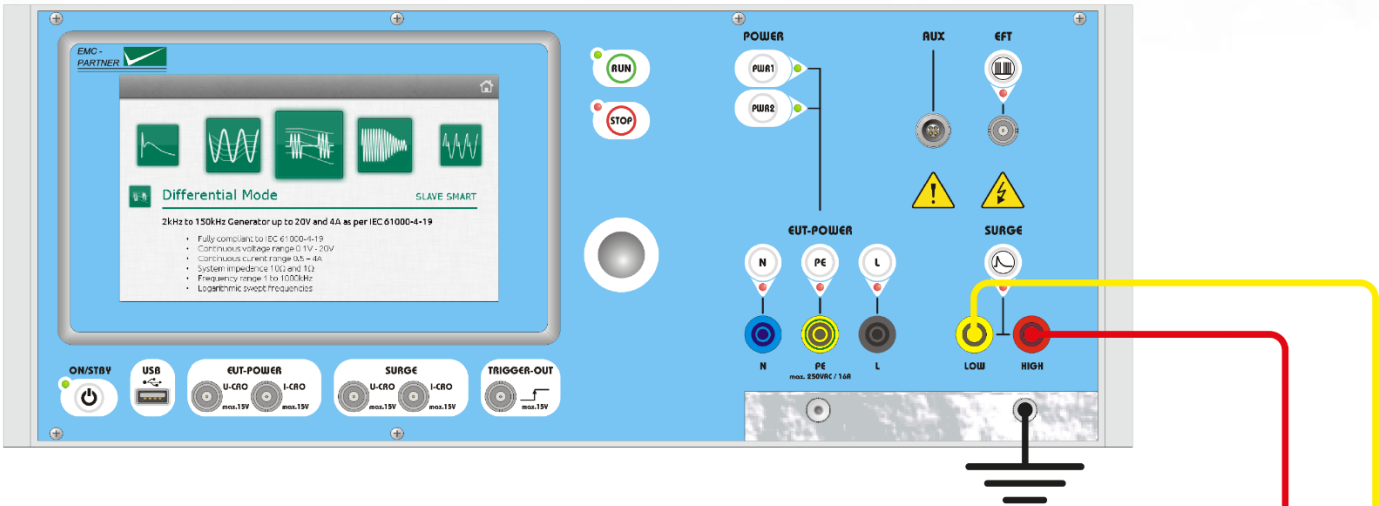
CDN-DATA-4L



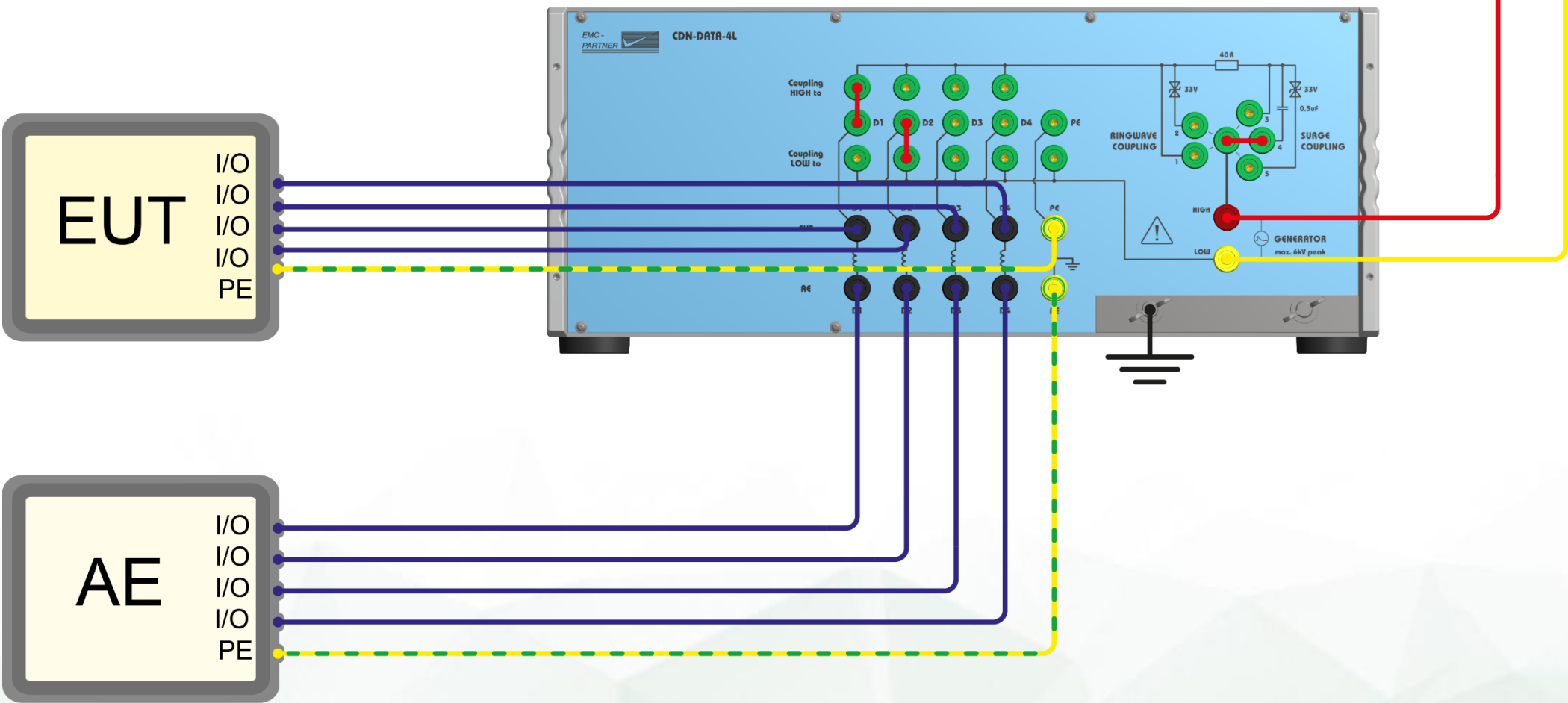
All coupling paths are calibrated successively, L-L and L-Gnd.

1.3.21. CWG: IMU4000 S, CDN-DATA-4L, test setup

IMU4000



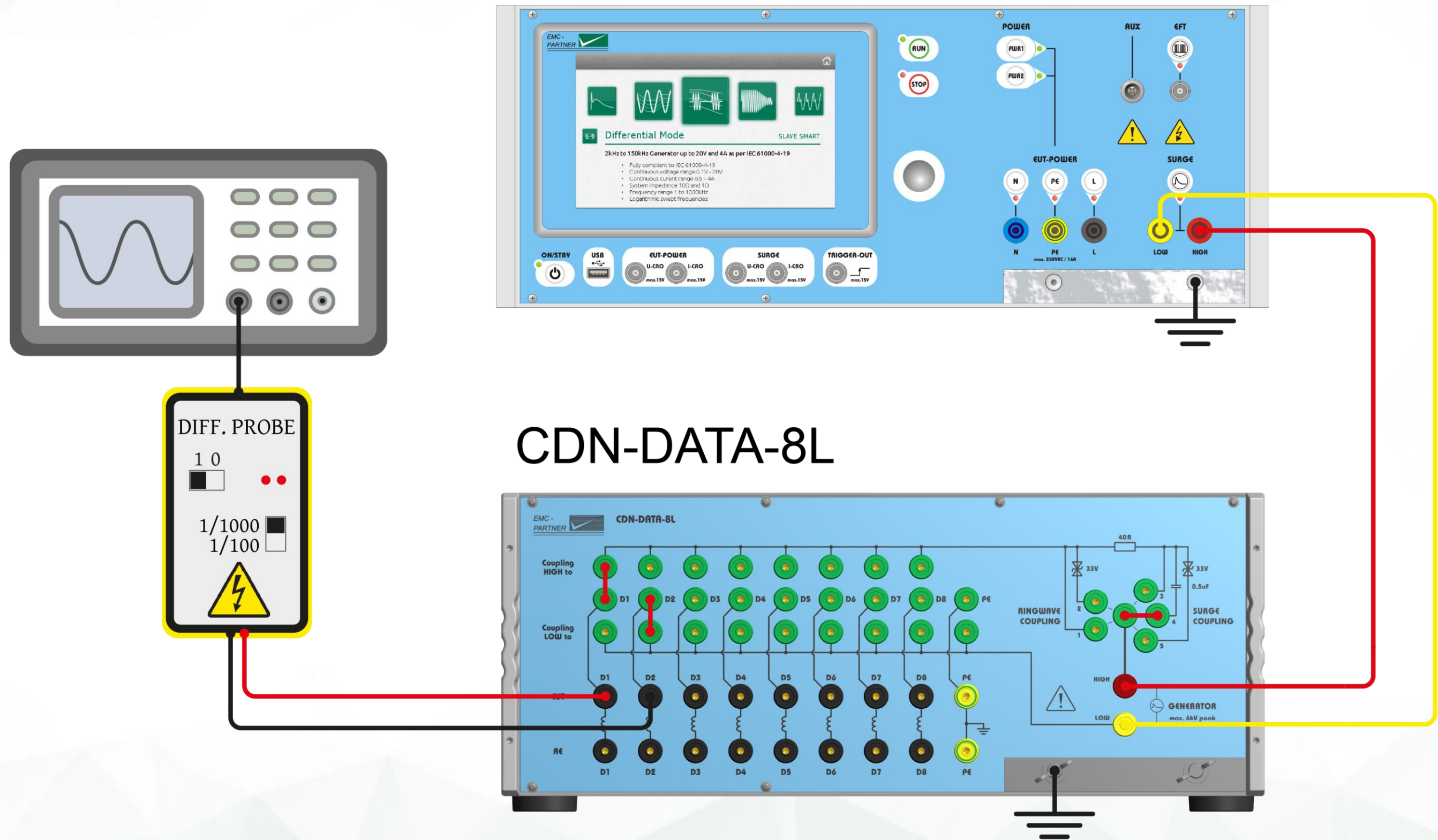
CDN-DATA-4L



After EUT and AE connections are performed, couplings are selected successively.

1.3.22. CWG: IMU4000 S, CDN-DATA-8L, voltage calibration setup

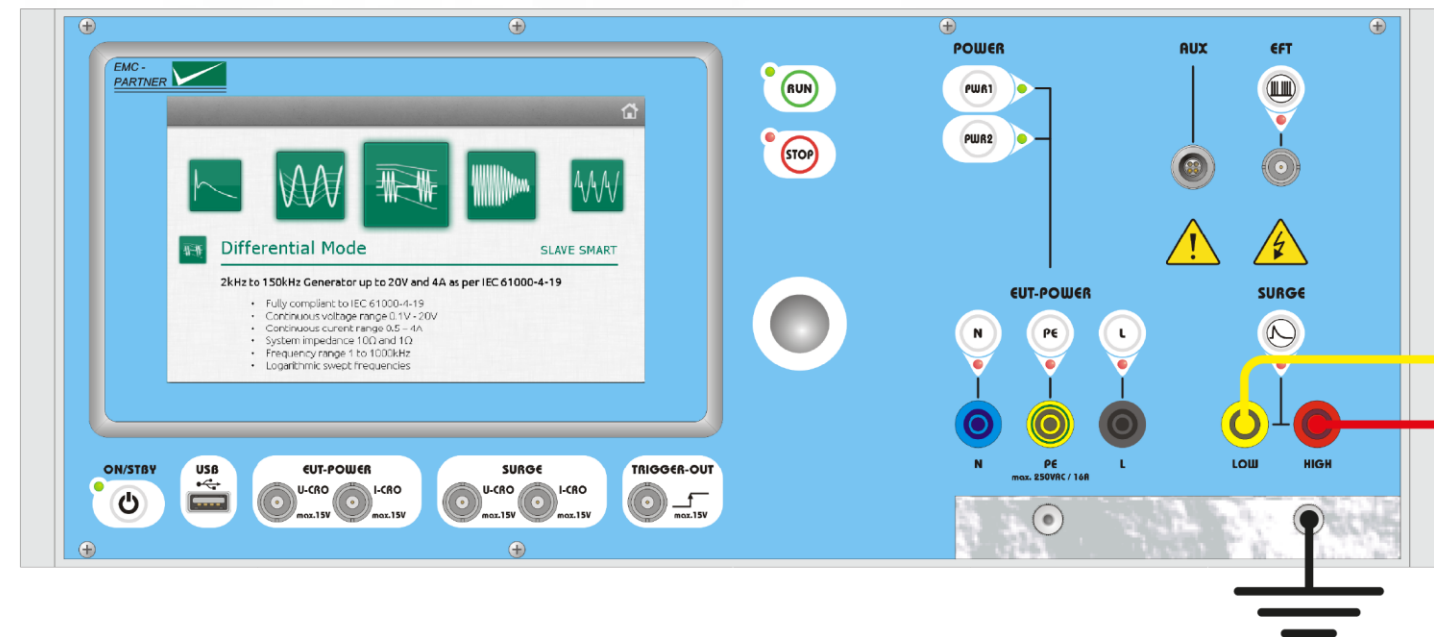
IMU4000



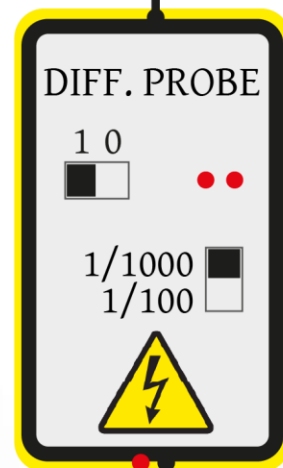
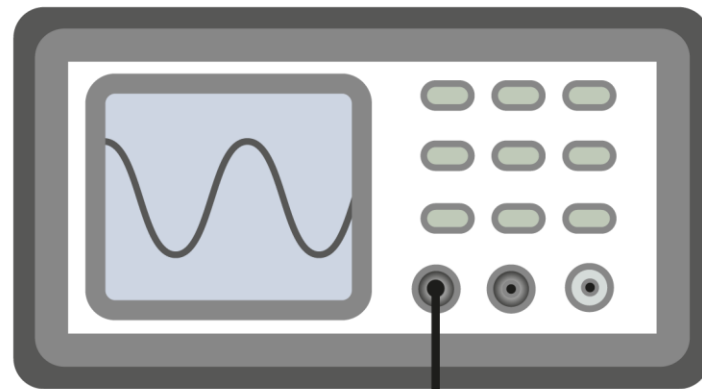
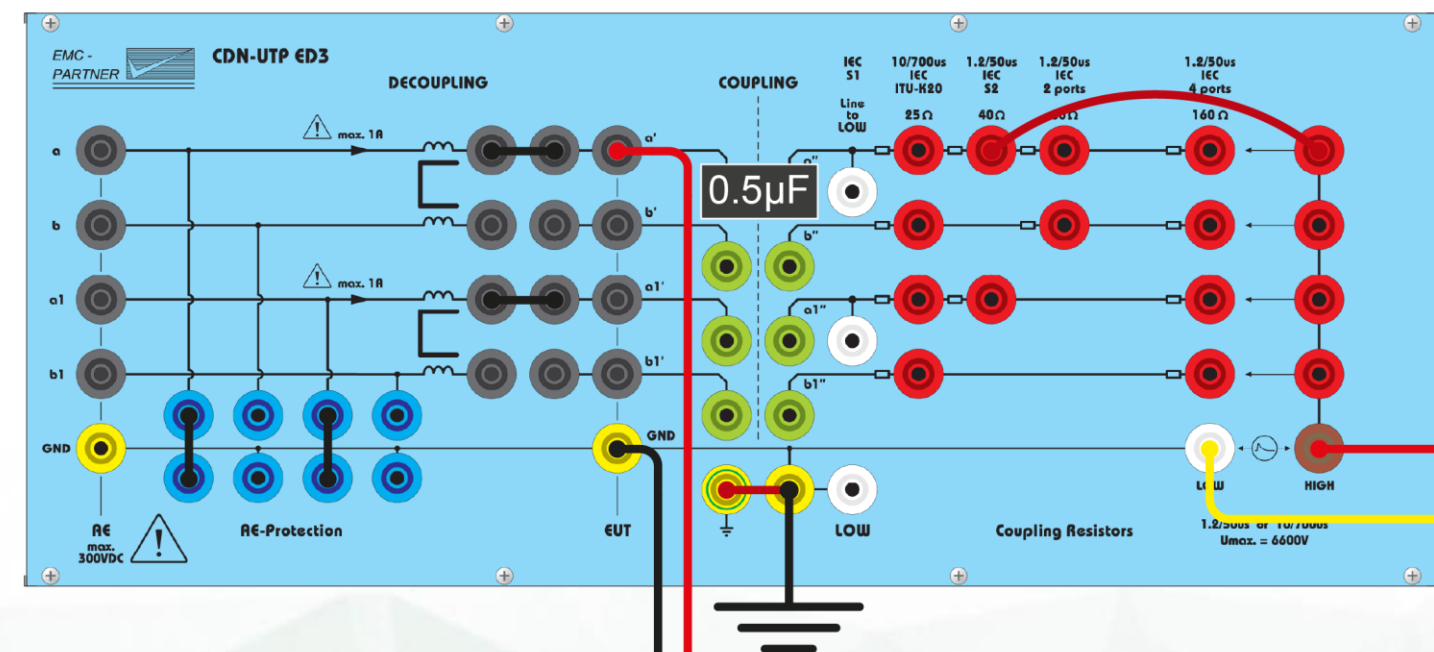
All coupling paths are calibrated successively, L-L and L-Gnd.

1.3.25. CWG: IMU4000 S, CDN-UTP ED3, voltage calibration setup for 2 unsym. lines

IMU4000



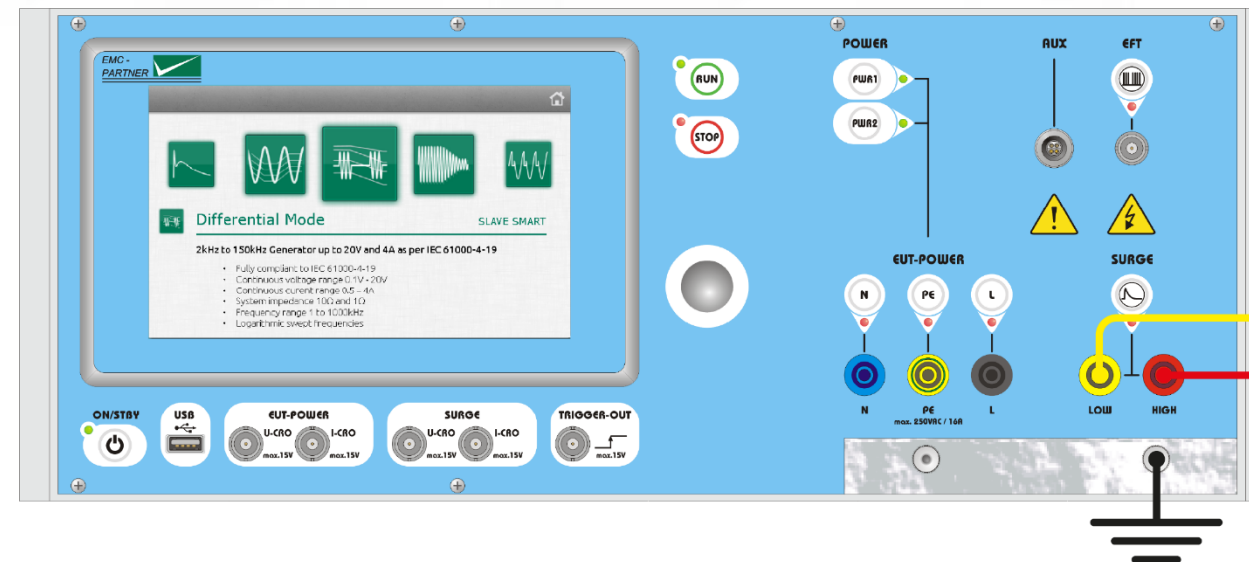
CDN-UTP ED3



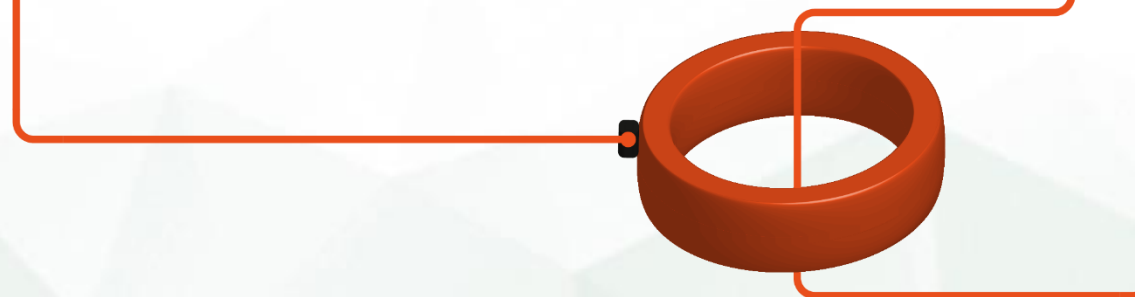
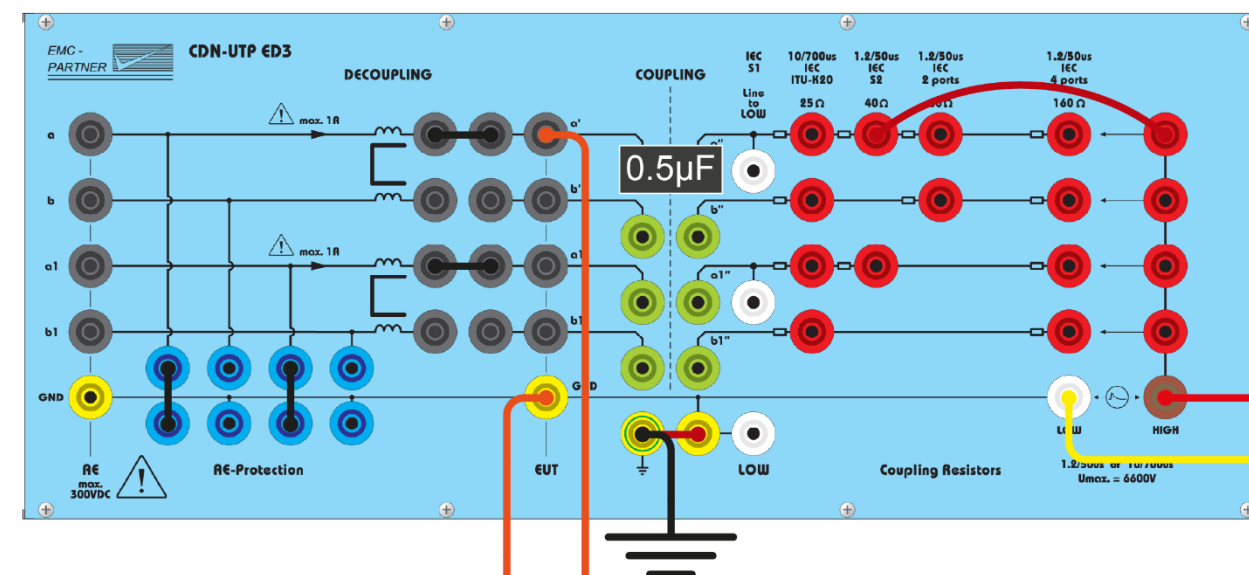
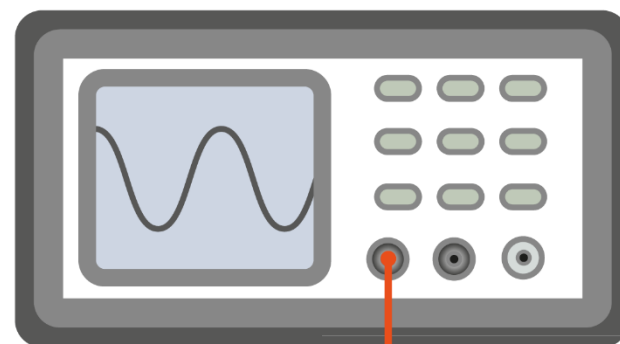
All coupling paths are calibrated successively, L1-L2, L1-Gnd and L2-Gnd.

1.3.26. CWG: IMU4000 S, CDN-UTP ED3, current calibration setup for 2 unsym. lines

IMU4000



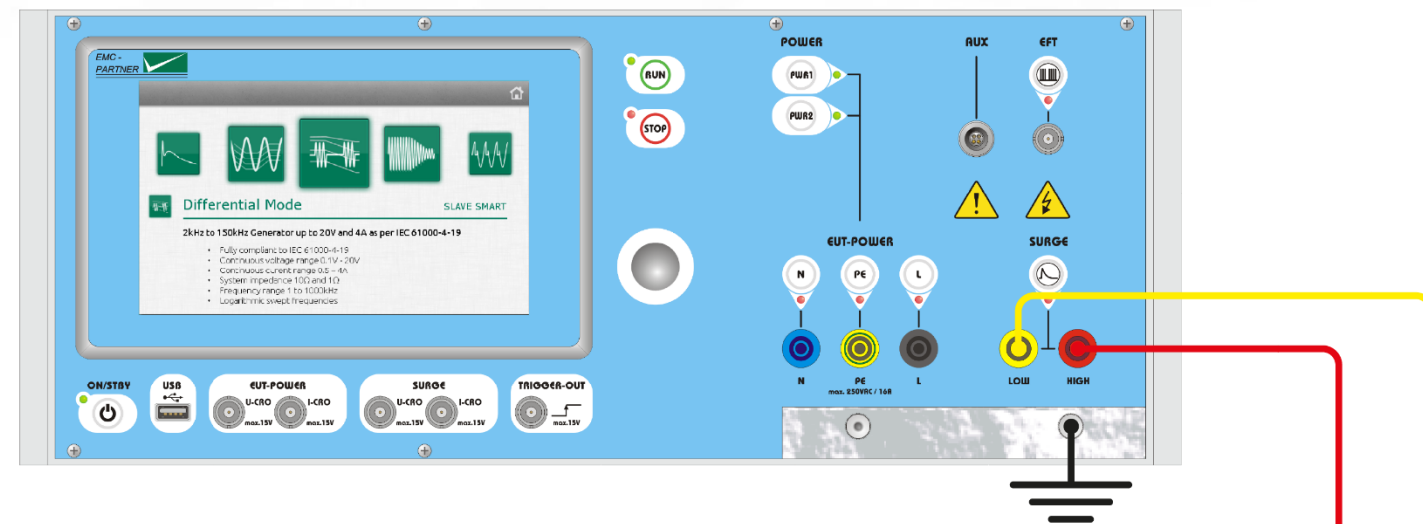
CDN-UTP ED3



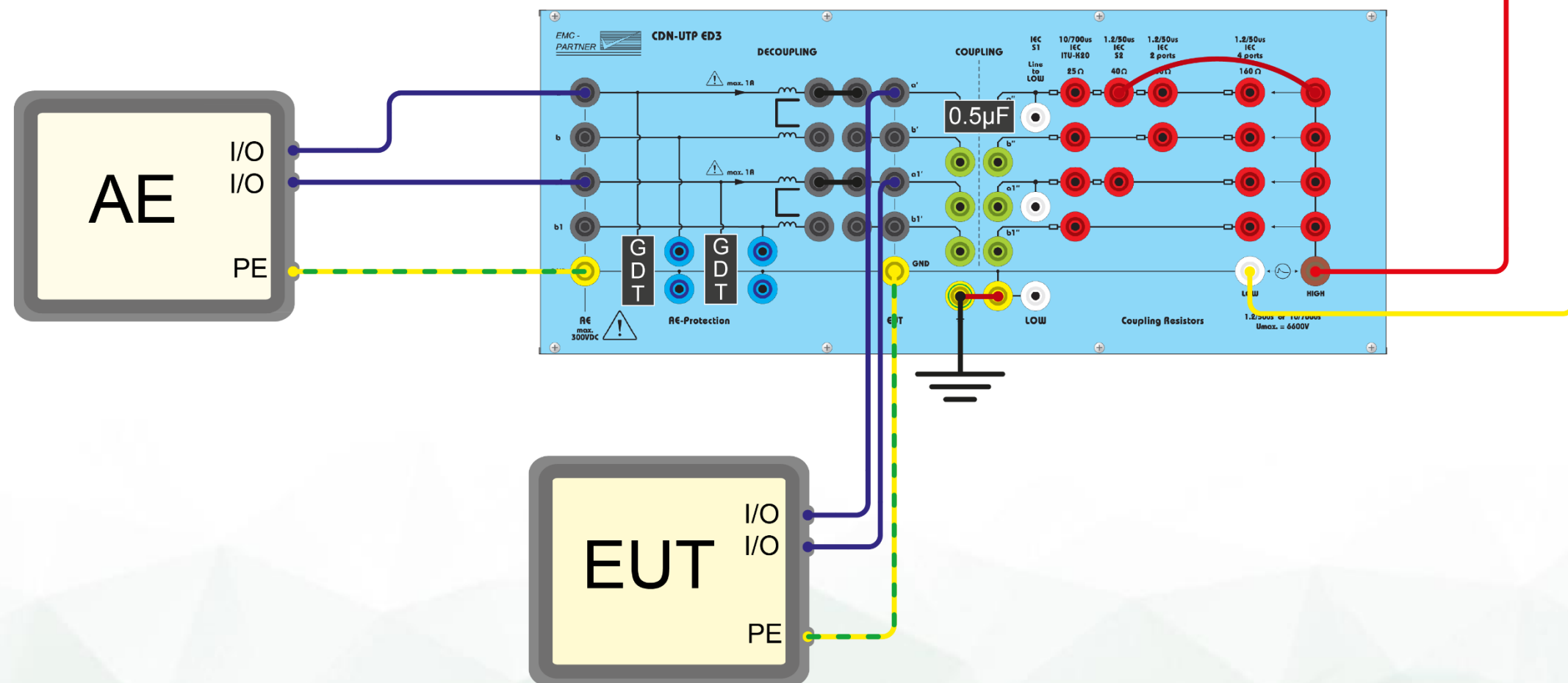
All coupling paths are calibrated successively, L1-L2, L1-Gnd and L2-Gnd.

1.3.27. CWG: IMU4000 S, CDN-UTP ED3, test setup for 2 unsym. lines

IMU4000



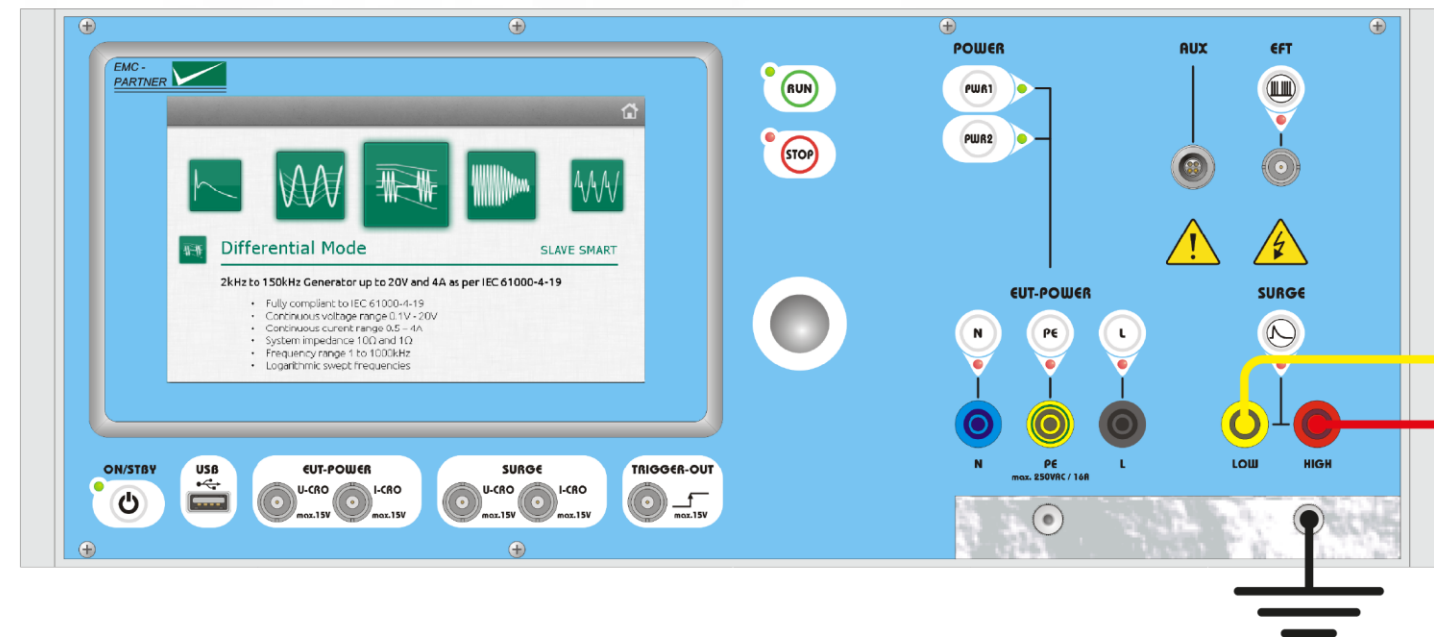
CDN-UTP ED3



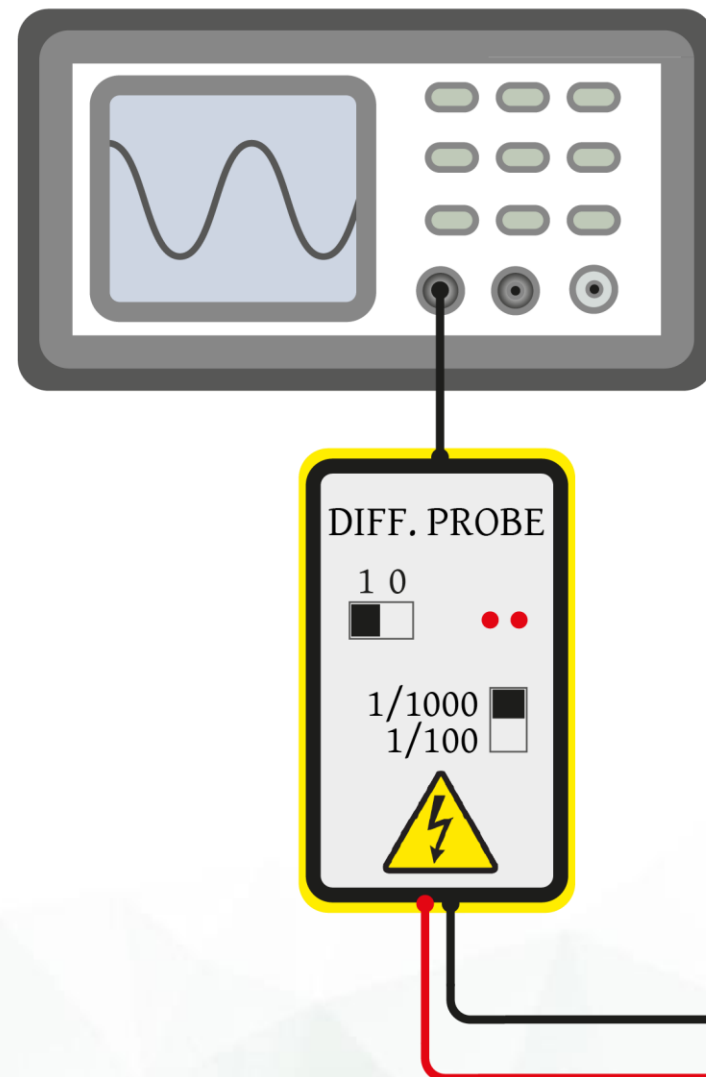
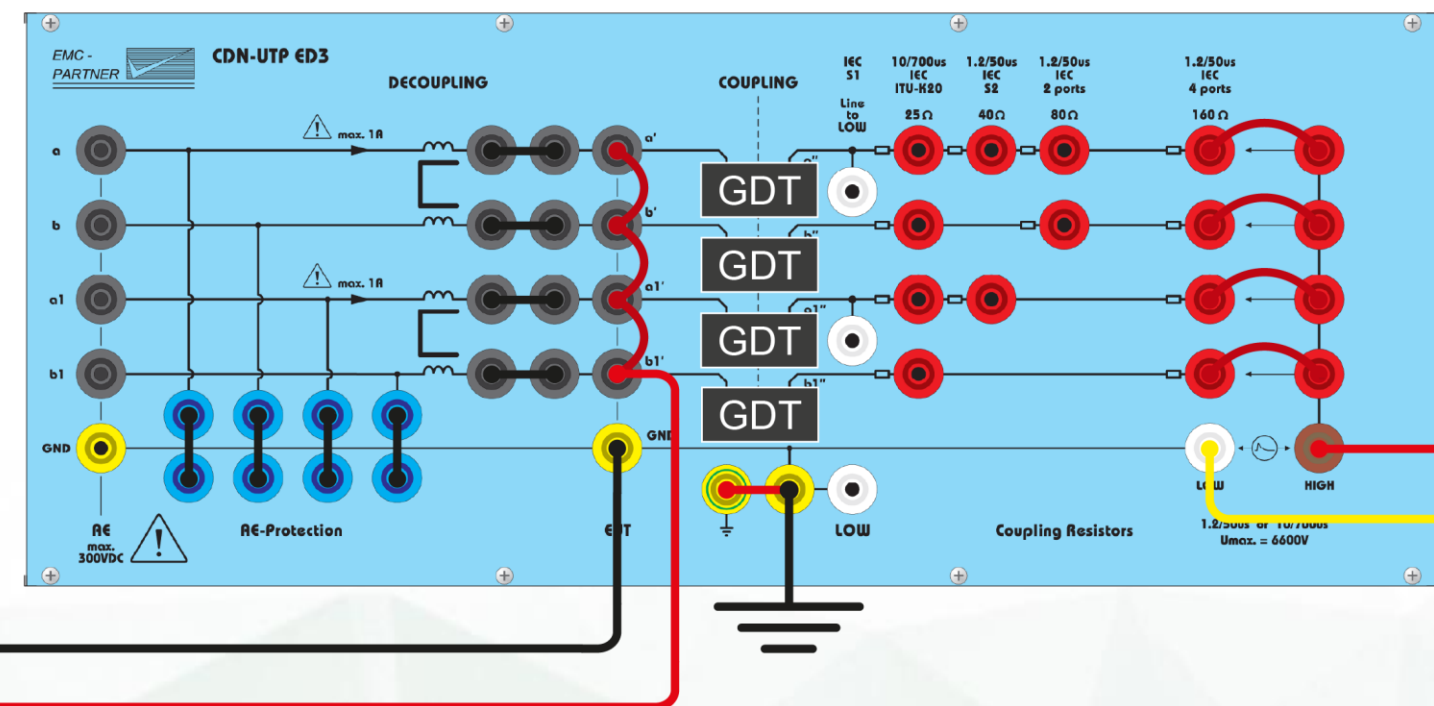
This CDN can be used also for testing up to 4 sym. lines. Maximum test level is 6 kV.

1.3.28. CWG: IMU4000 S, CDN-UTP ED3, voltage calibration setup for 4 sym. lines (2 sym. lines also possible)

IMU4000



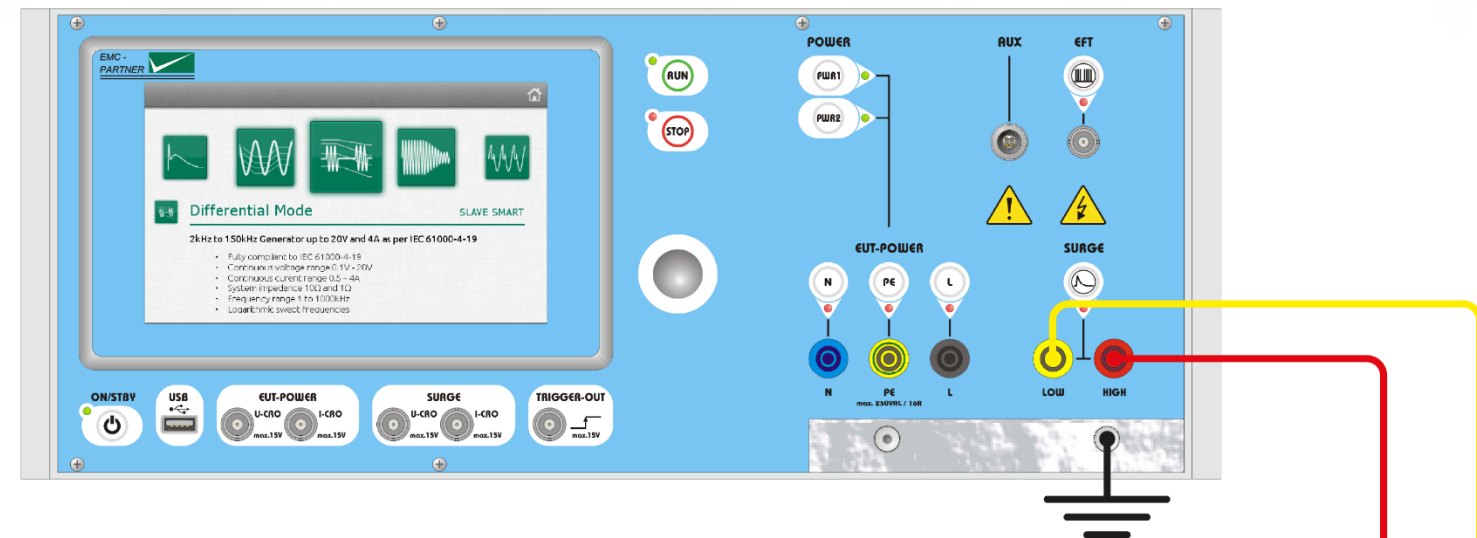
CDN-UTP ED3



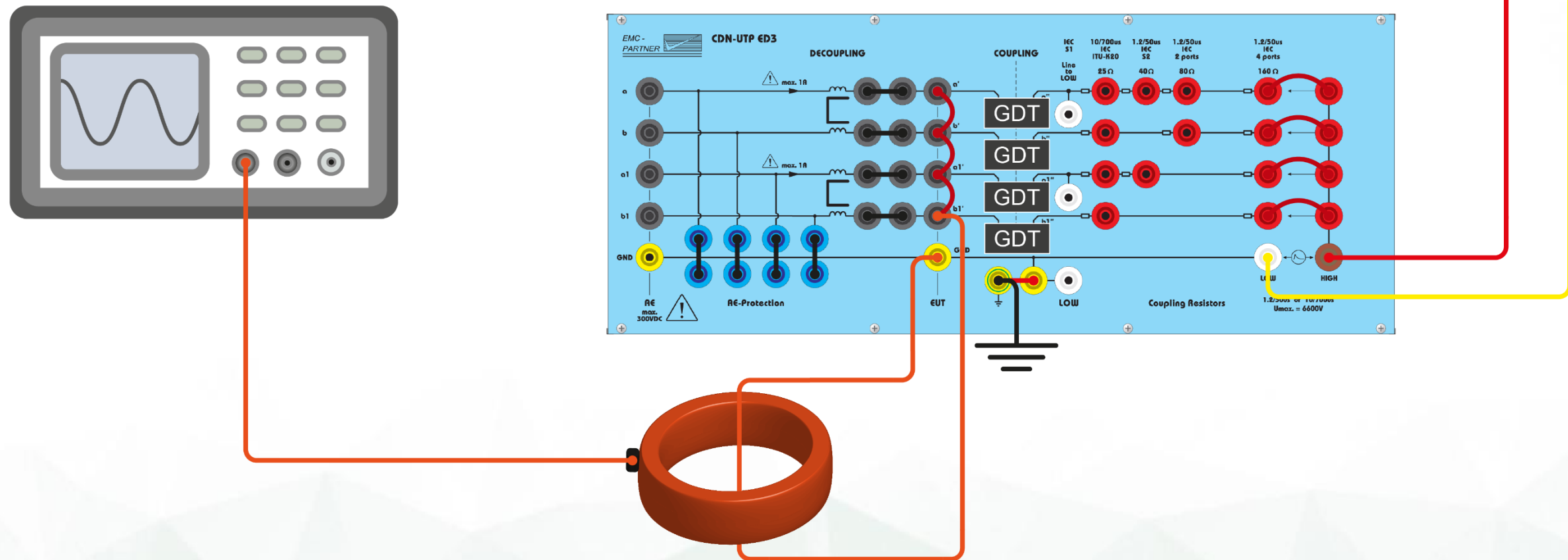
For 4 lines, coupling is performed with 4 x 160 Ω and 4 x GDT.

1.3.29. CWG: IMU4000 S, CDN-UTP ED3, current calibration setup for 4 sym. lines (2 sym. lines also possible)

IMU4000



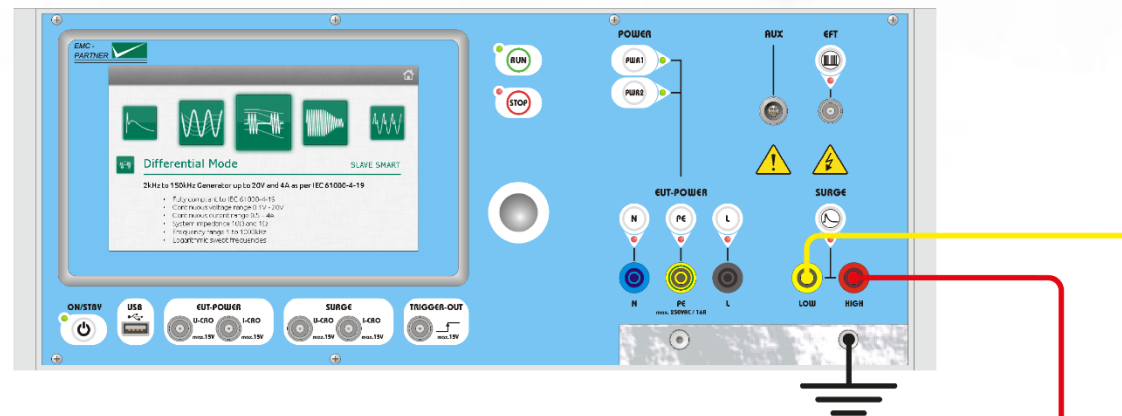
CDN-UTP ED3



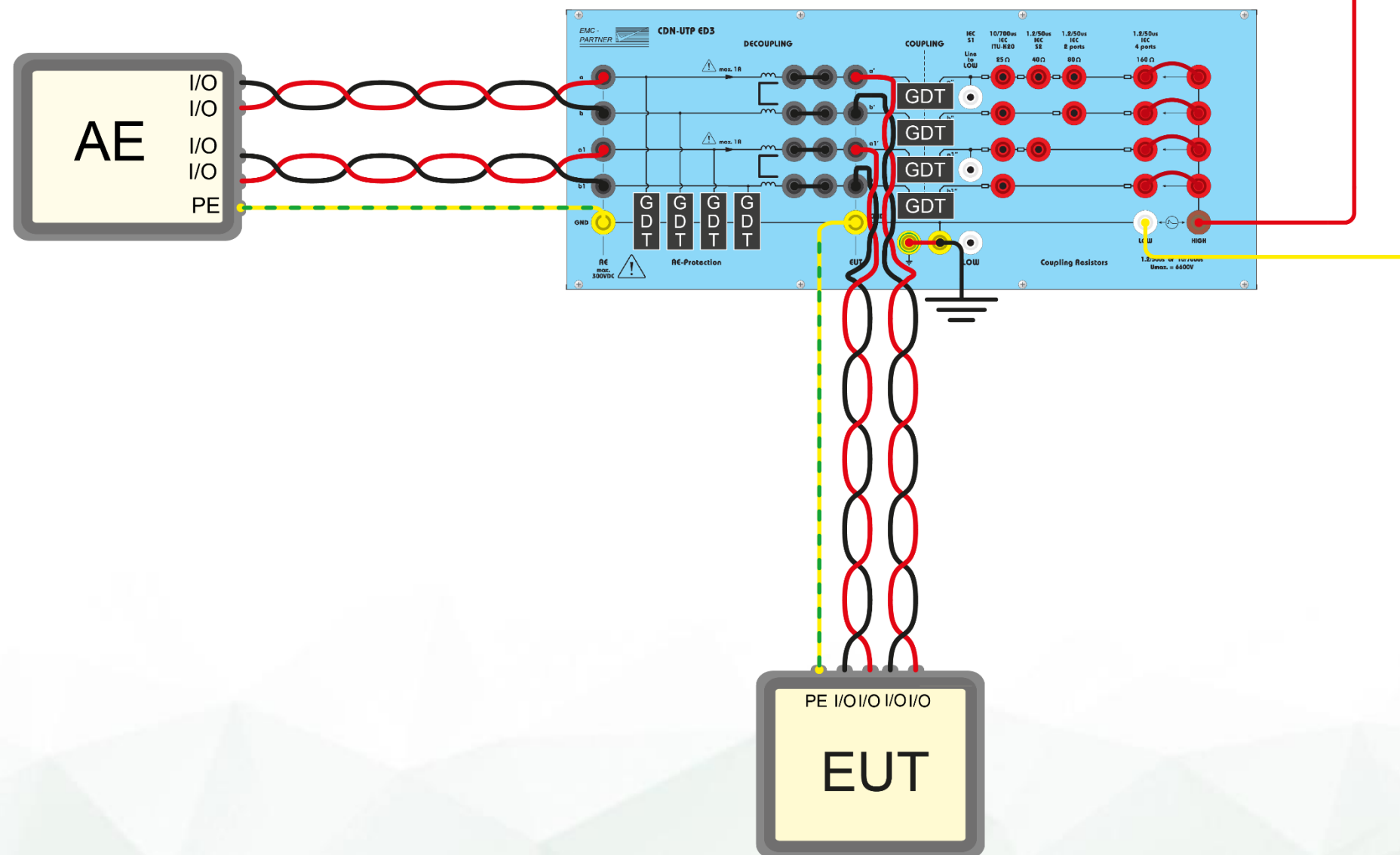
AE side is connected to ground during calibration.

1.3.30. CWG: IMU4000 S, CDN-UTP ED3, test setup for 4 sym. lines (2 sym. lines also possible)

IMU4000



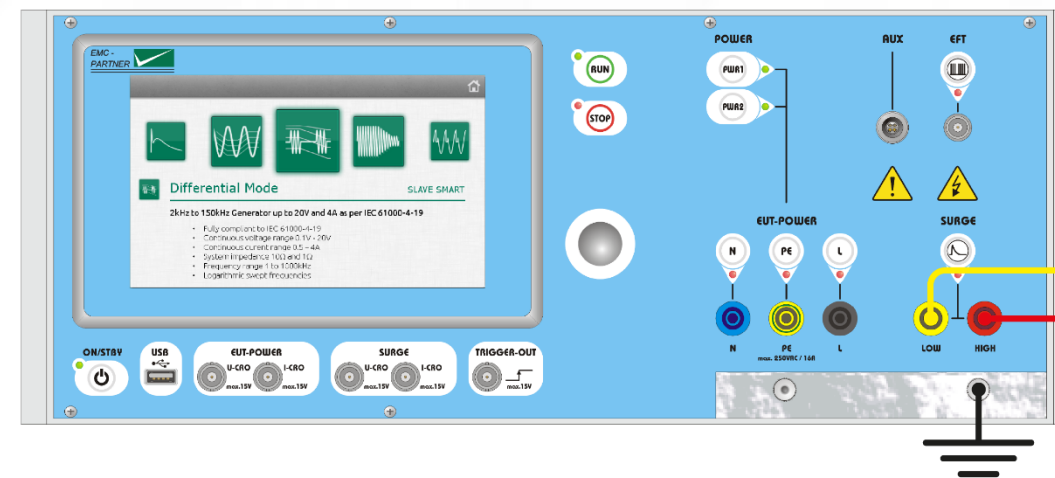
CDN-UTP ED3



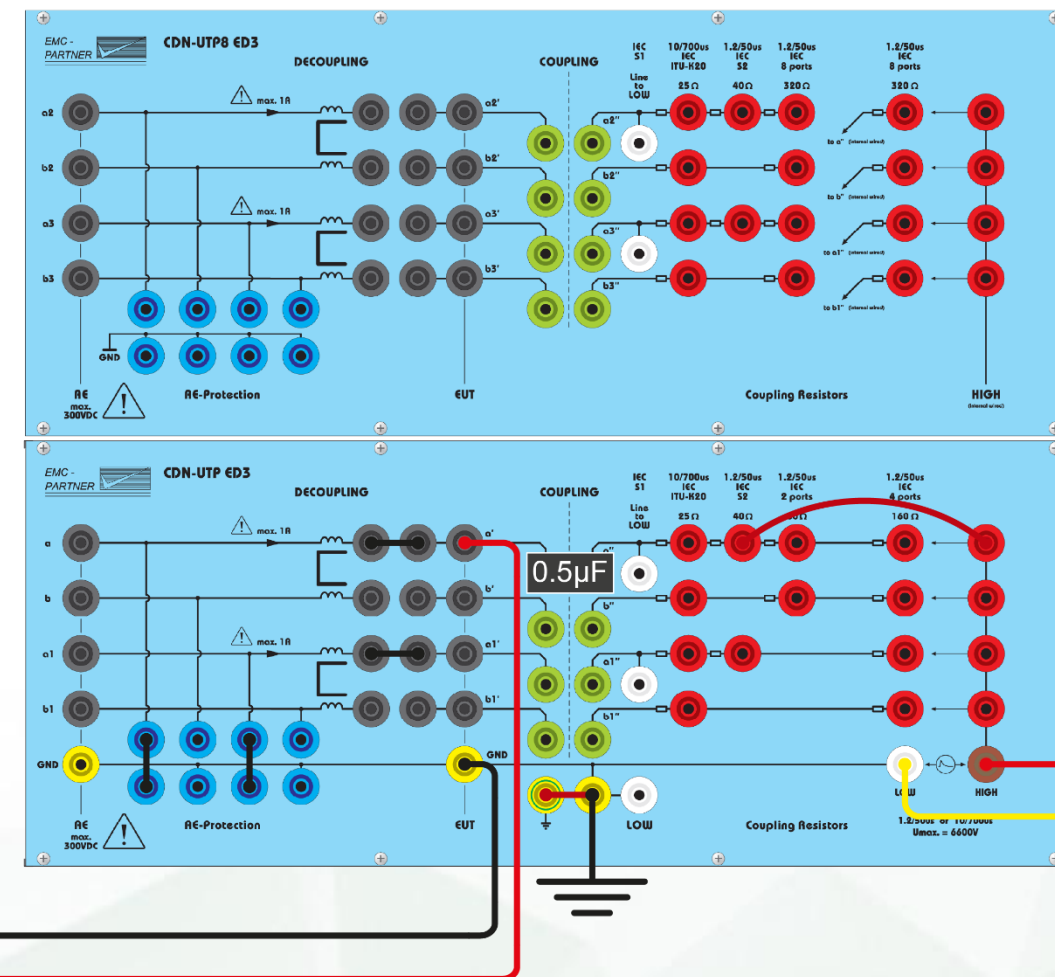
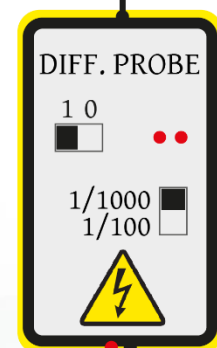
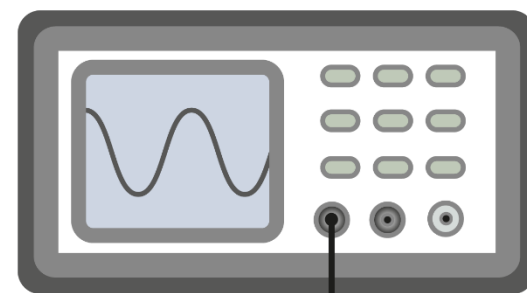
Coupling: all lines against Gnd.

1.3.31. CWG: IMU4000 S, CDN-UTP8 ED3, voltage calibration setup for 2 unsym. lines (4 unsym. lines also possible)

IMU4000



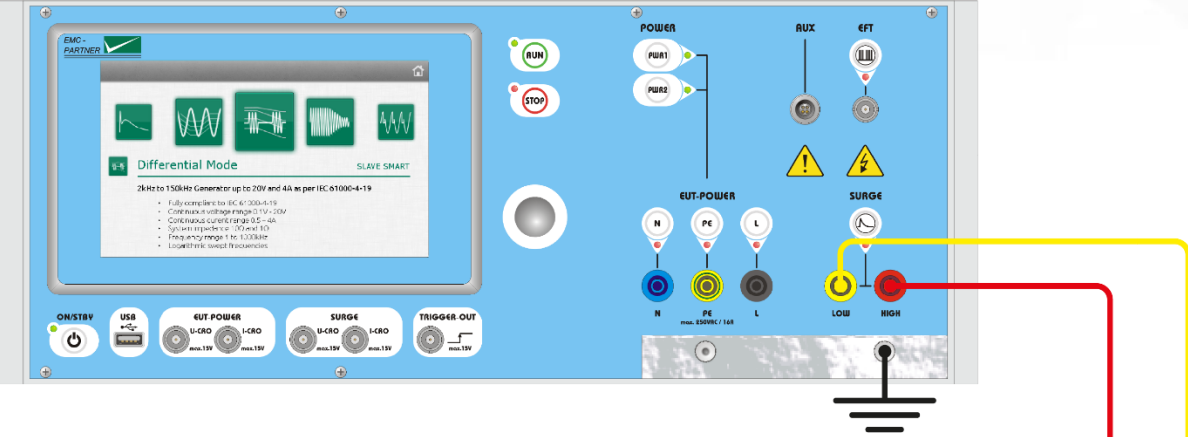
CDN-UTP8 ED3



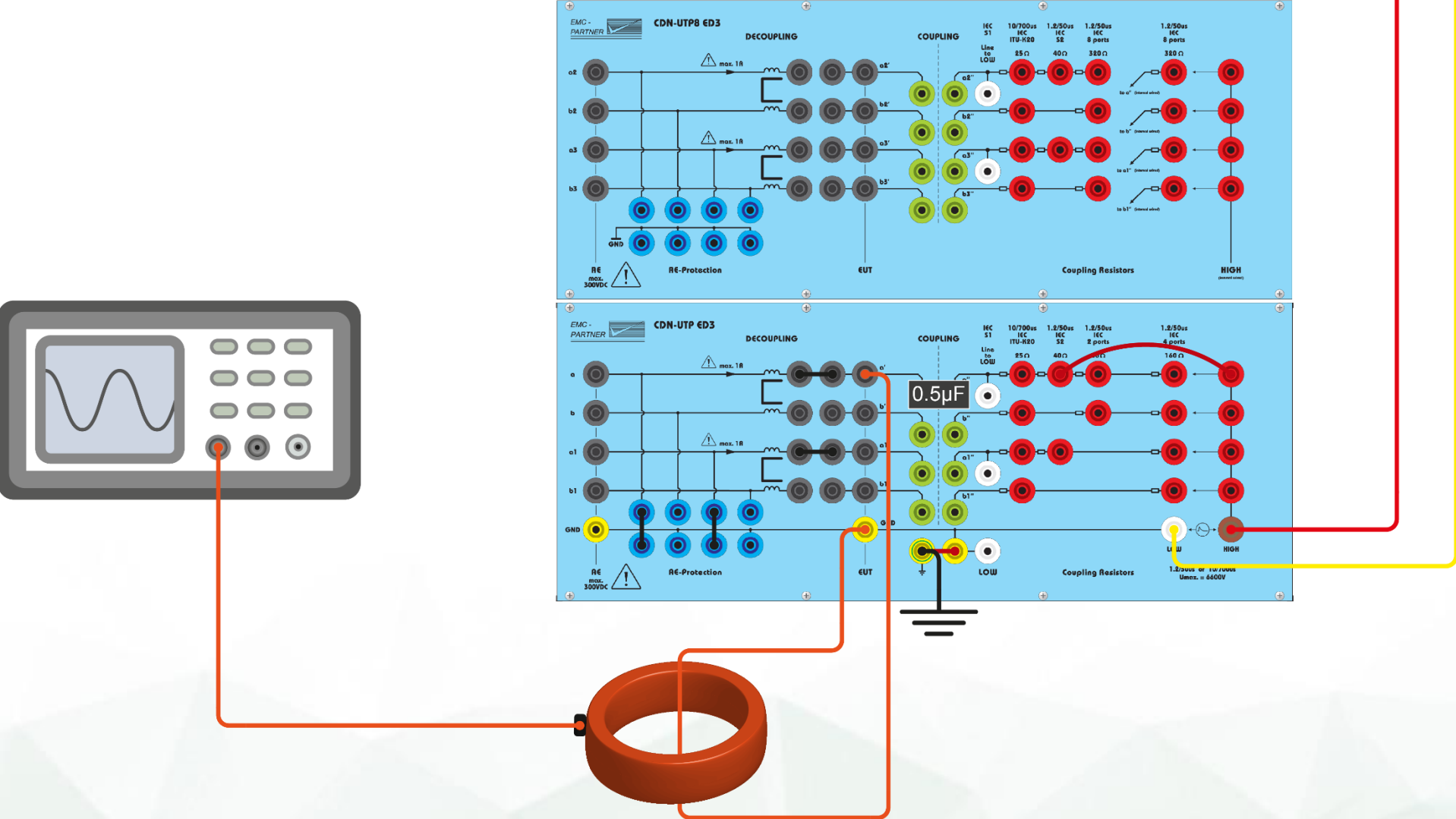
All coupling paths are calibrated successively, L-L and L-Gnd.

1.3.32. CWG: IMU4000 S, CDN-UTP8 ED3, current calibration setup for 2 unsym. lines (4 unsym. lines also possible)

IMU4000



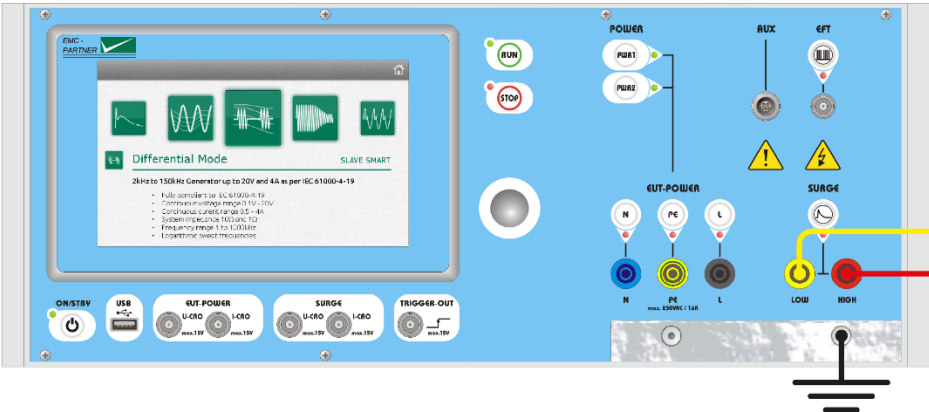
CDN-UTP8 ED3



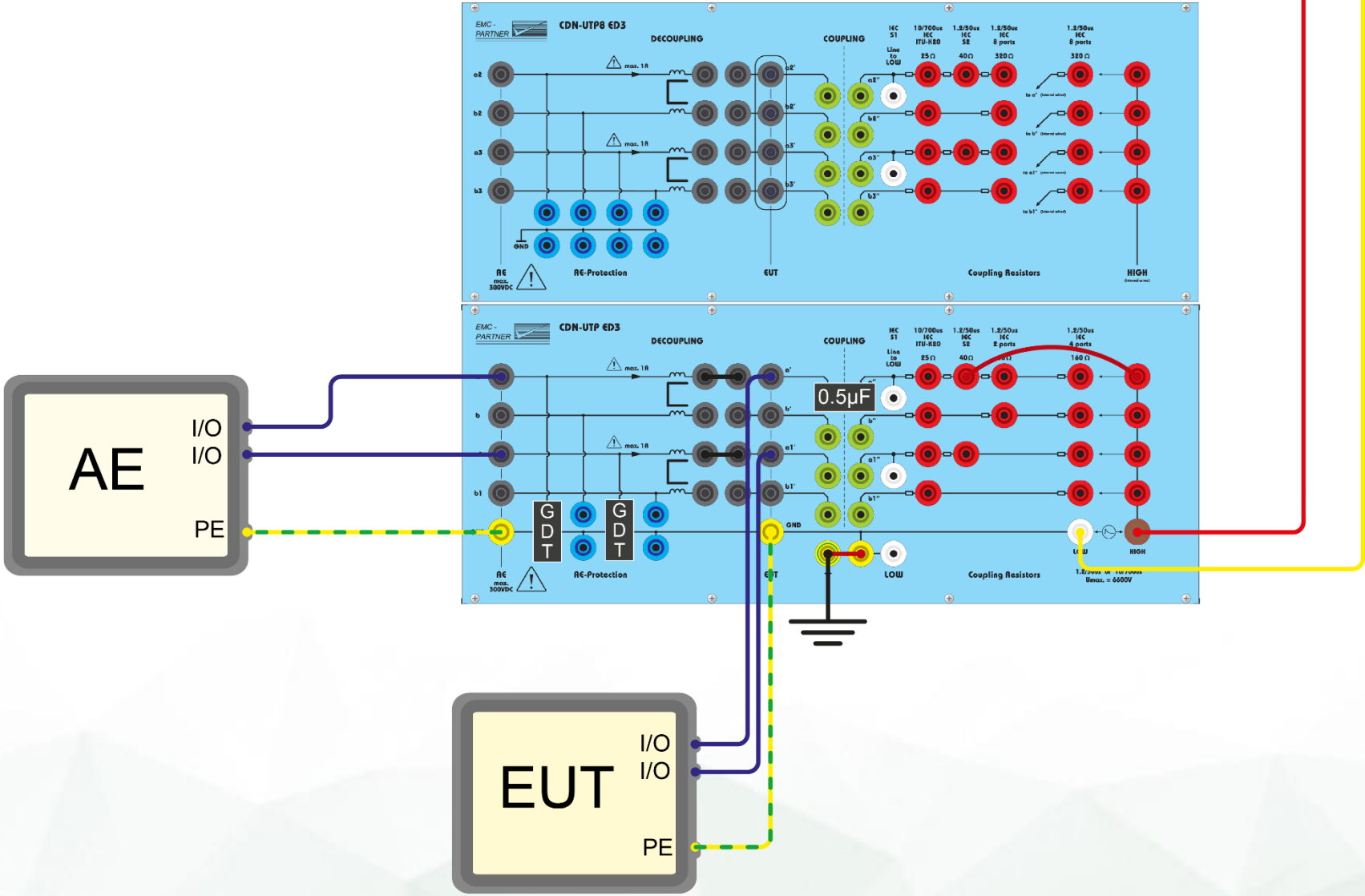
All coupling paths are calibrated successively, L-L and L-Gnd.

1.3.33. CWG: IMU4000 S, CDN-UTP8 ED3, test setup for 2 unsym. lines (4 unsym. lines also possible)

IMU4000



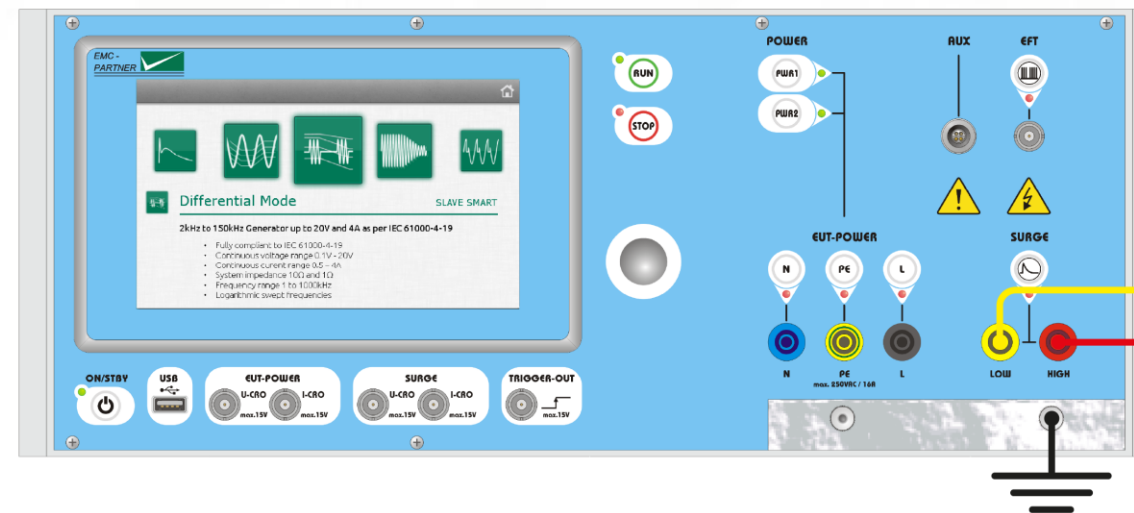
CDN-UTP8 ED3



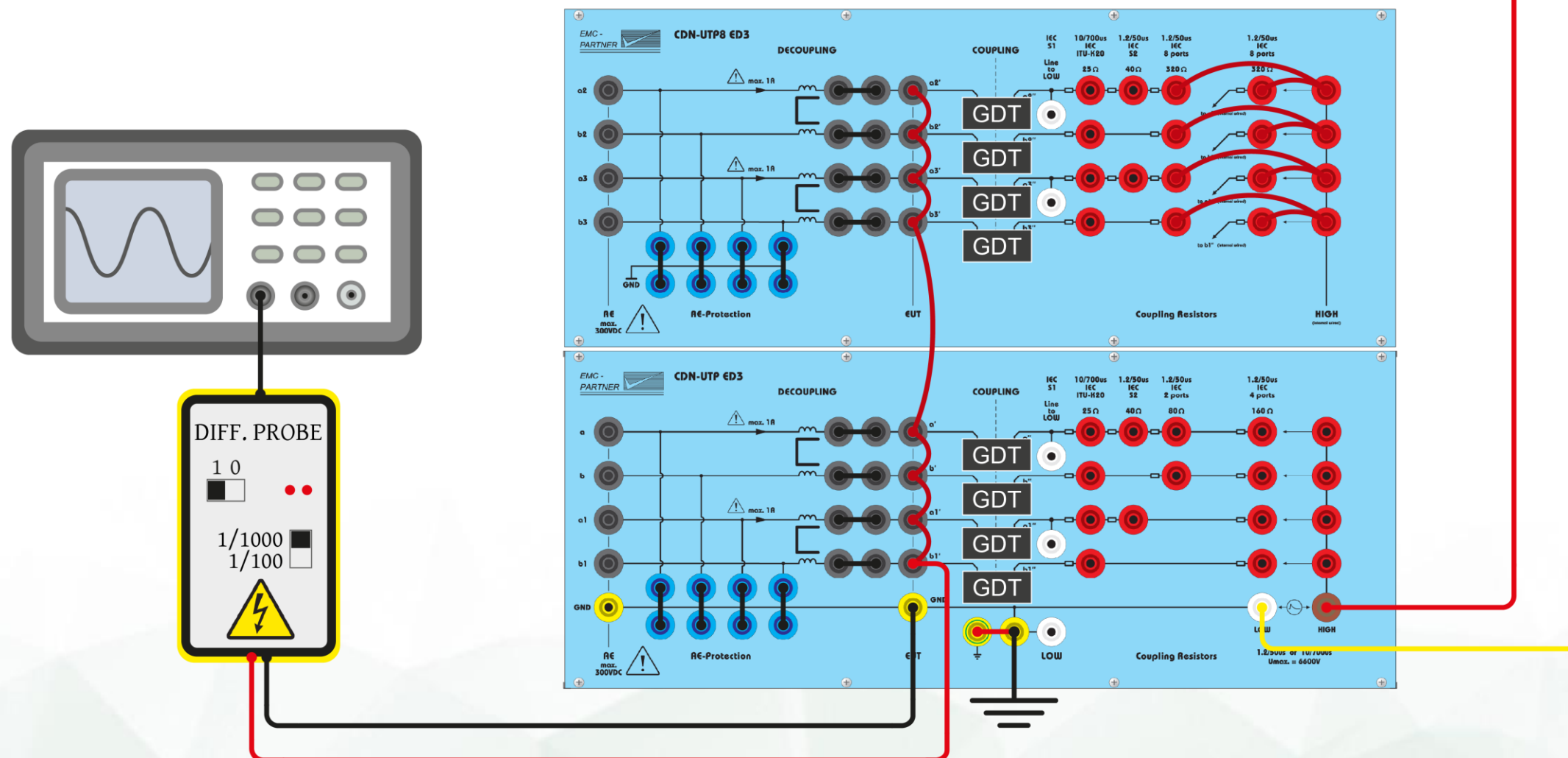
This CDN can be used also for testing up to 8 high speed sym. lines. Maximum test level is 6 kV.

1.3.34. CWG: IMU4000 S, CDN-UTP8 ED3, voltage calibration setup for 8 symmetrical lines (2, 4 sym. lines also possible)

IMU4000



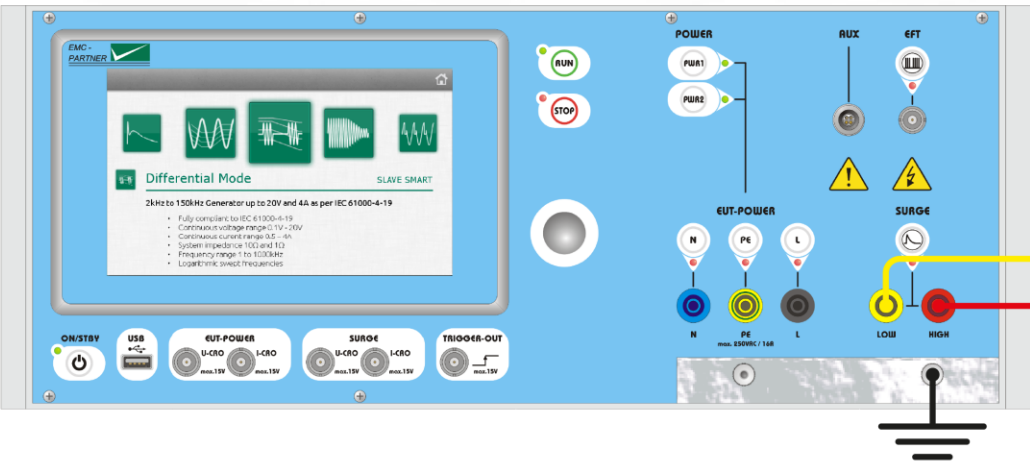
CDN-UTP8 ED3



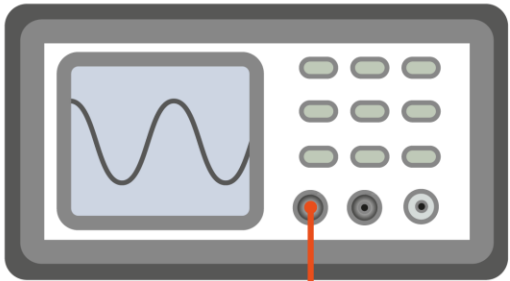
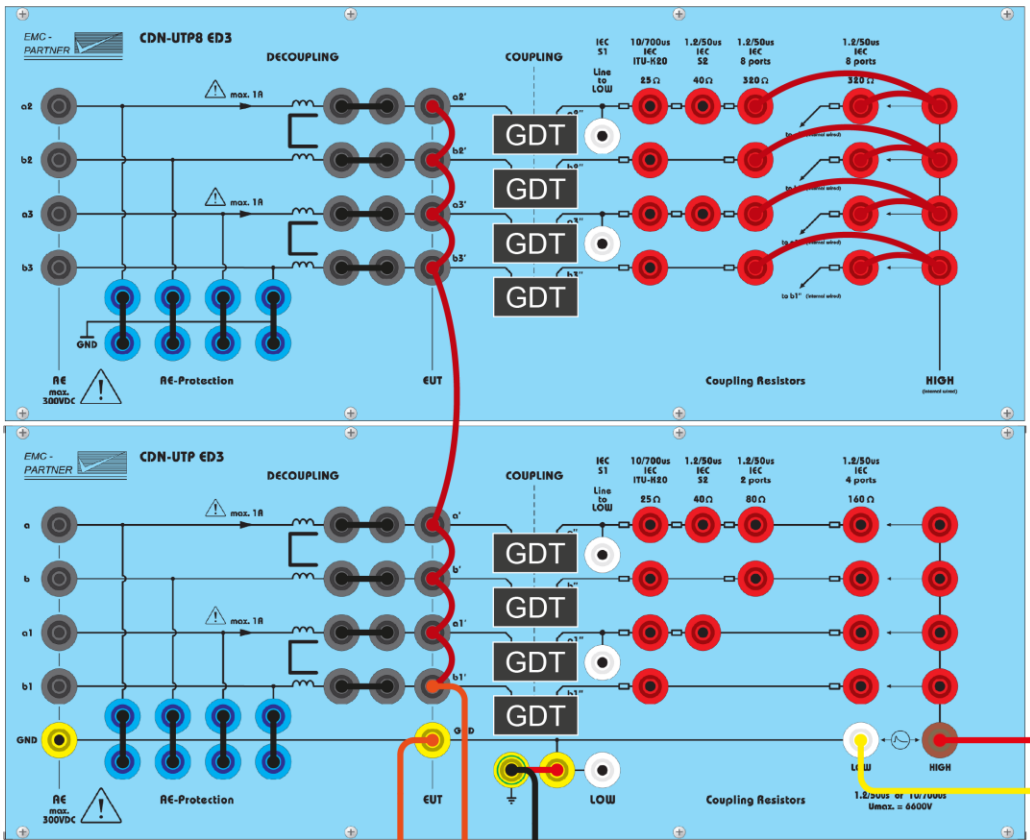
For 4 lines, coupling is performed with 8 x 320 Ω and 8 x GDT.

1.3.35. CWG: IMU4000 S, CDN-UTP8 ED3, current calibration setup for 8 sym. lines (2, 4 sym. lines also possible)

IMU4000

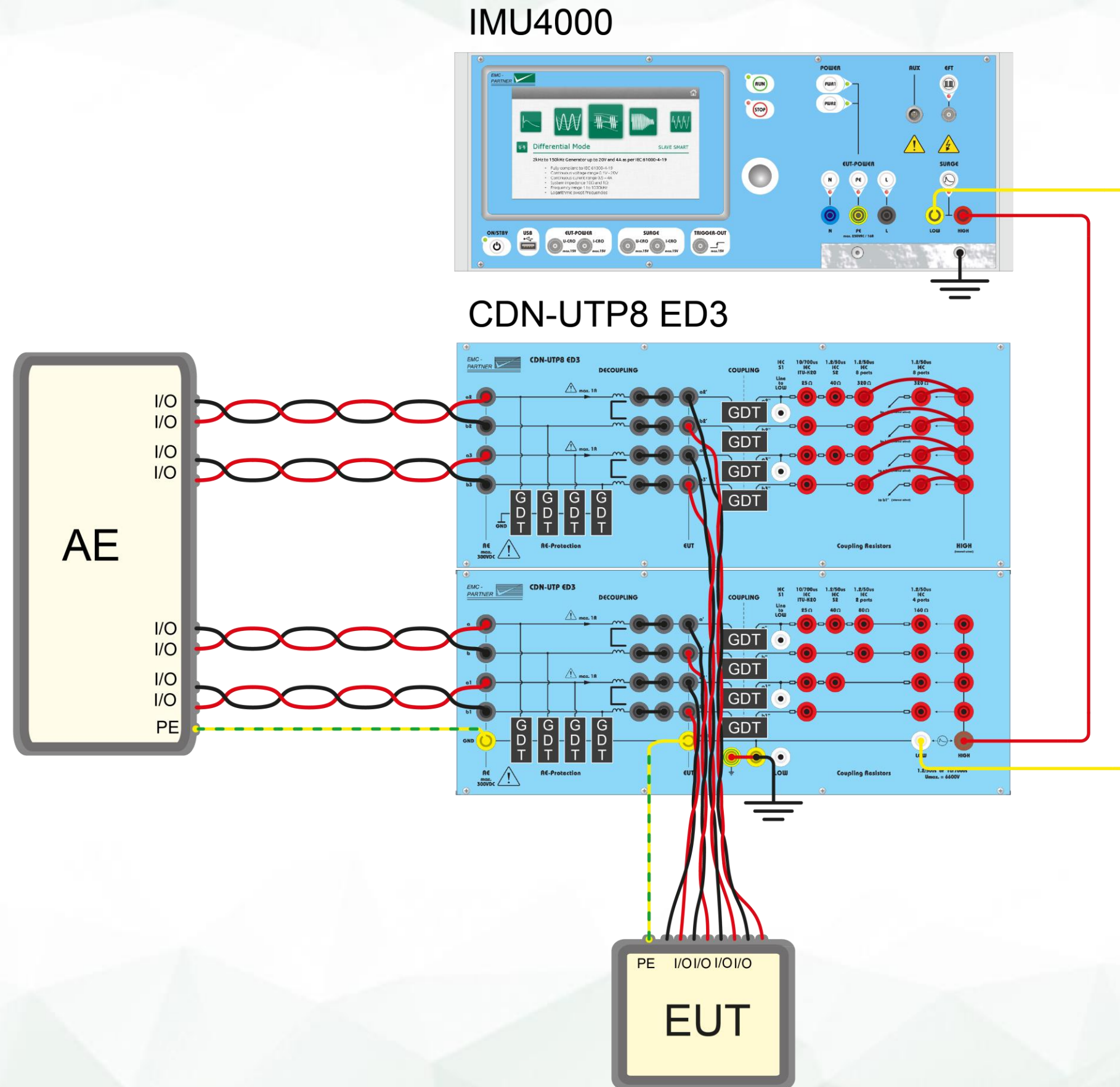


CDN-UTP8 ED3



AE side is connected to ground during calibration.

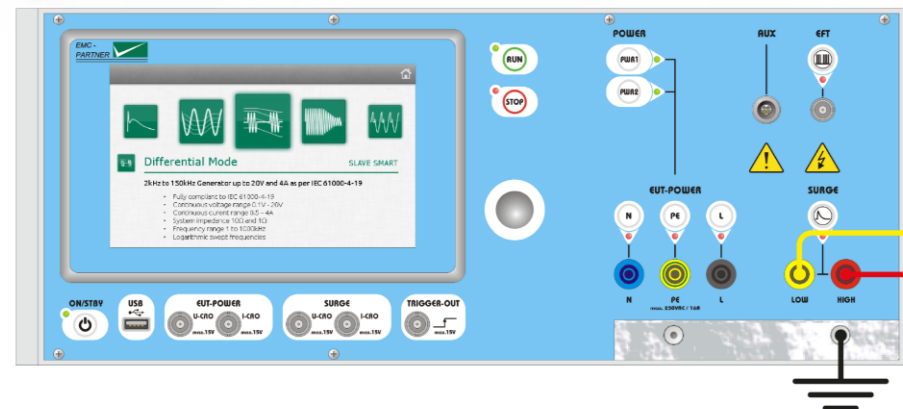
1.3.36. CWG: IMU4000 S, CDN-UTP8 ED3, test setup for 8 sym. lines without Ethernet adapters (2, 4 sym. lines also possible)



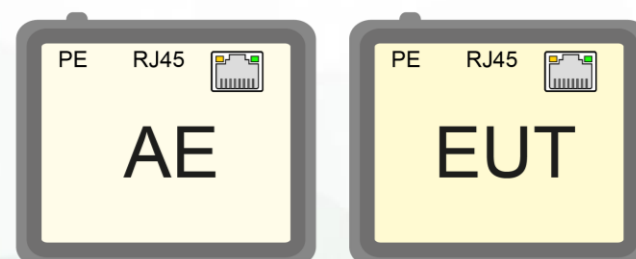
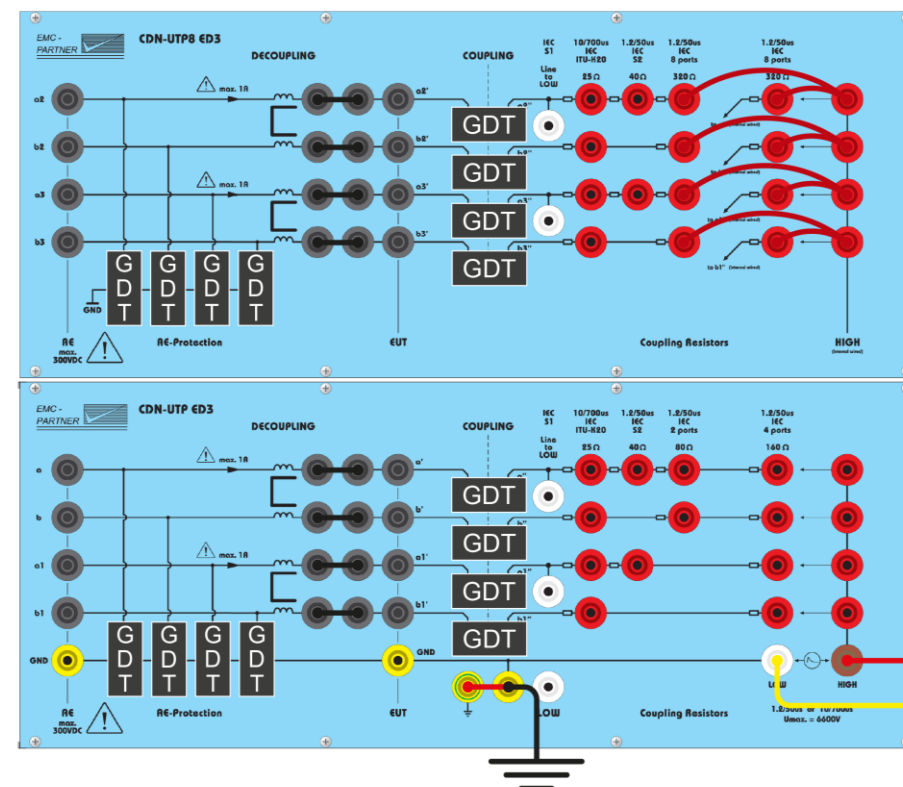
Coupling: all lines against Gnd.

1.3.37. CWG: IMU4000 S, CDN-UTP8 ED3, test setup for 8 sym. lines with Ethernet adapters, **step one**: connections and bridges on the front panel

IMU4000



CDN-UTP8 ED3

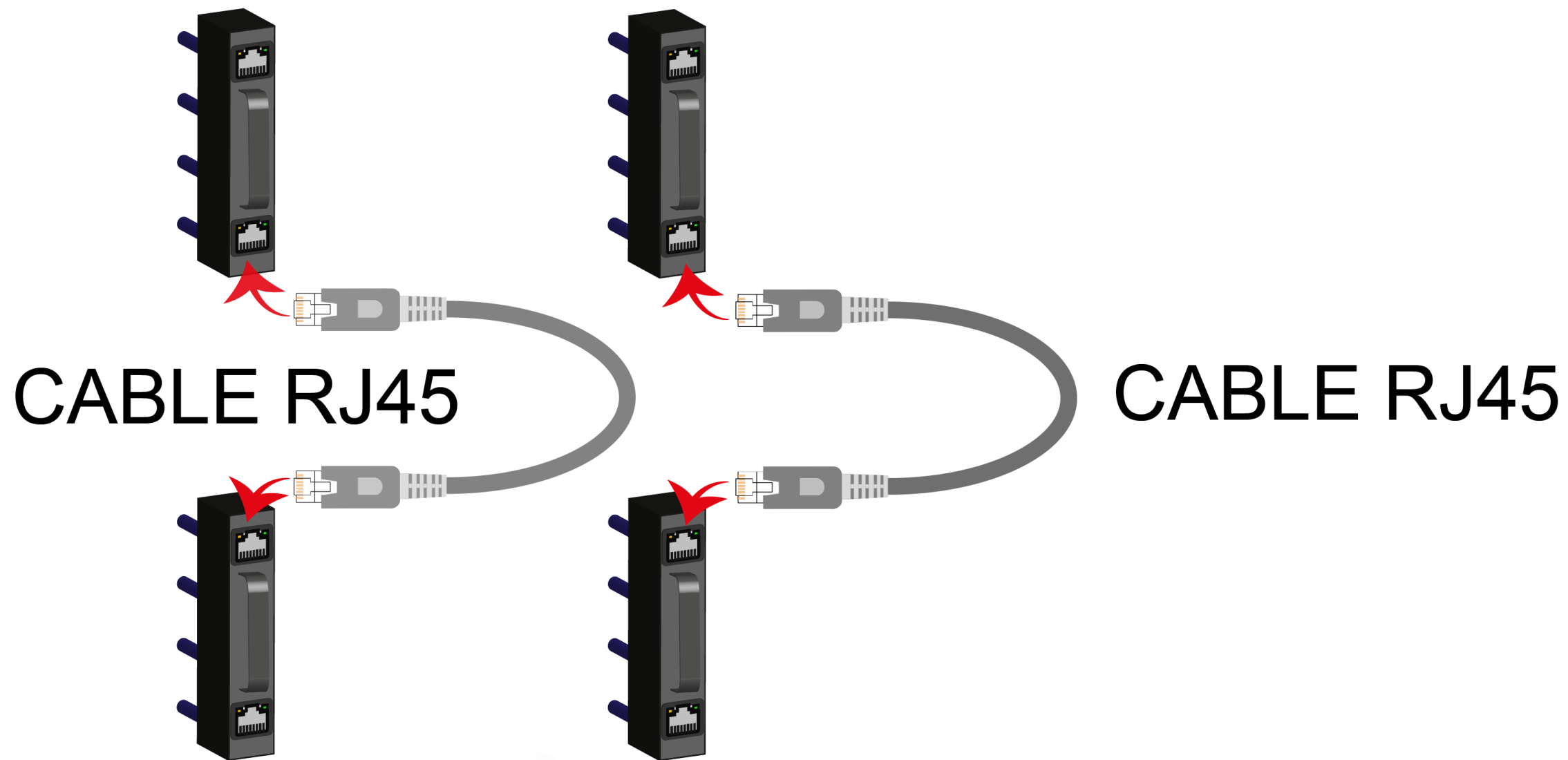


Coupling resistors, elements have to be connected, protection elements on AE side have to be connected.

1.3.38. CWG: IMU4000 S, CDN-UTP8 ED3, test setup for 8 sym. lines with Ethernet adapters, **step two**: prepare adapters and cables

ADAPTER
BOX RJ45

ADAPTER
BOX RJ45



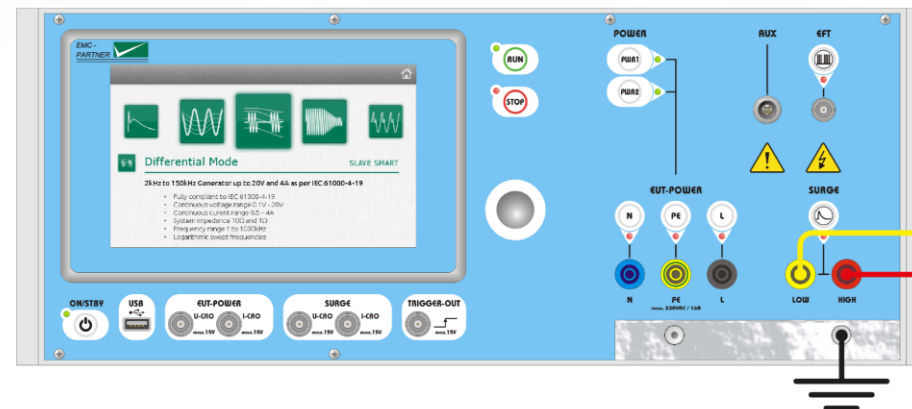
ADAPTER
BOX RJ45

ADAPTER
BOX RJ45

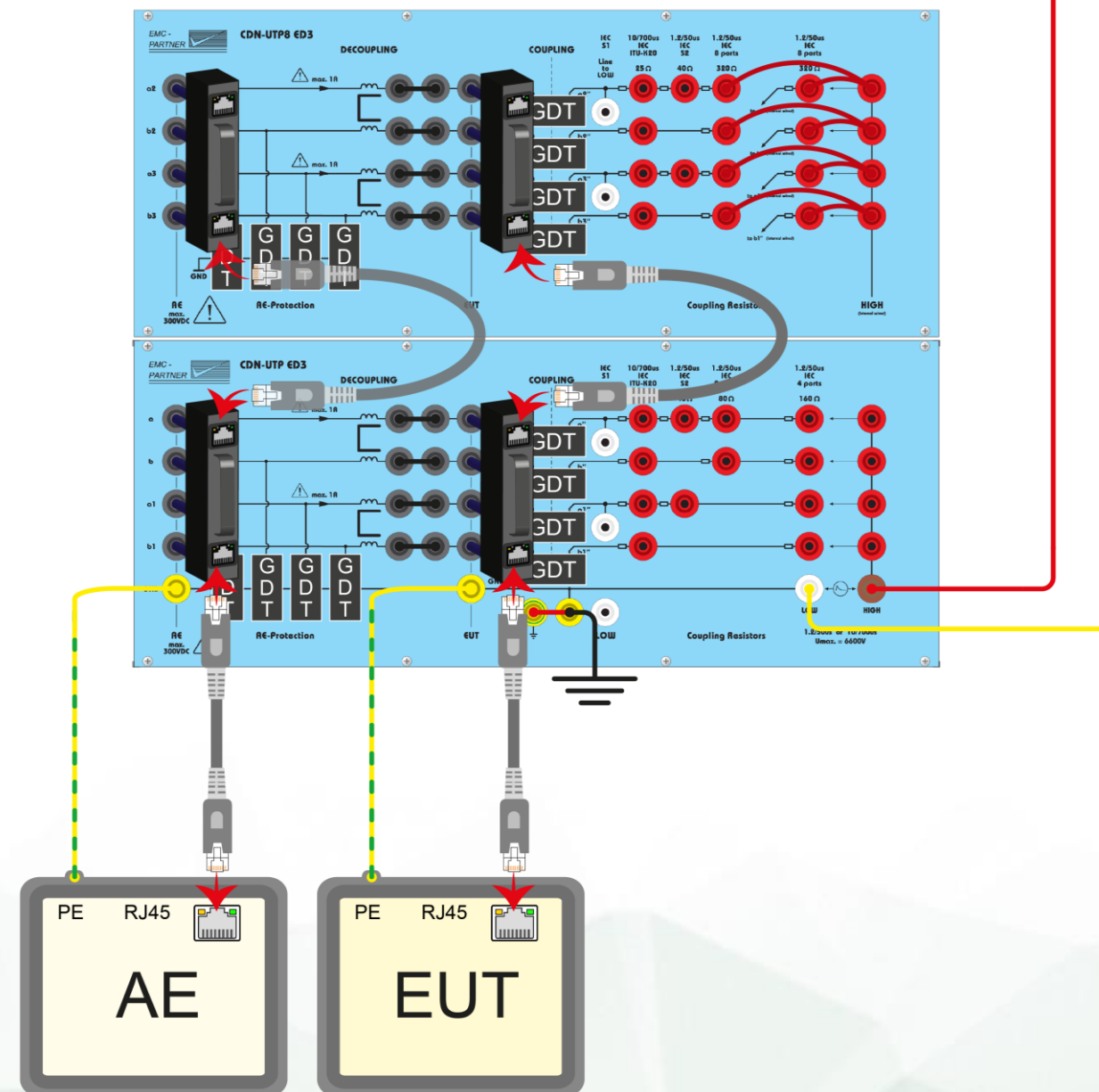
In order to maintain a high speed transmission, special adapters are utilized.

1.3.39. CWG: IMU4000 S, CDN-UTP8 ED3, test setup for 8 sym. lines with Ethernet adapters, **step three**: connect adapters, cables, EUT and AE

IMU4000



CDN-UTP8 ED3



Coupling: all lines against Gnd.

1.4. Magnetic field 50/60 Hz calibration and test setup as per IEC 61000-4-8 latest edition

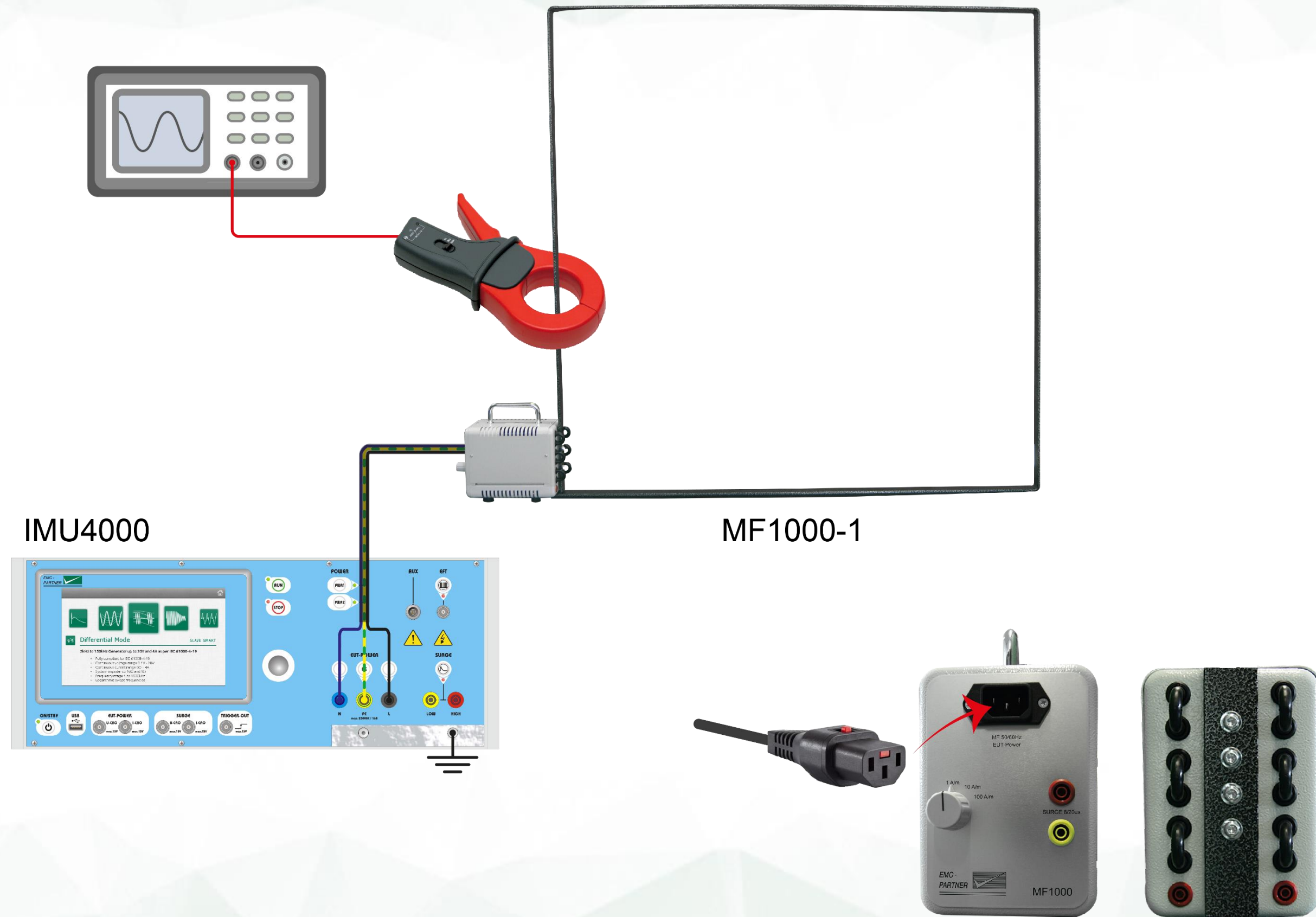
IEC 61000-4-8
Edition 2.0 / 2009



Customer advantages:

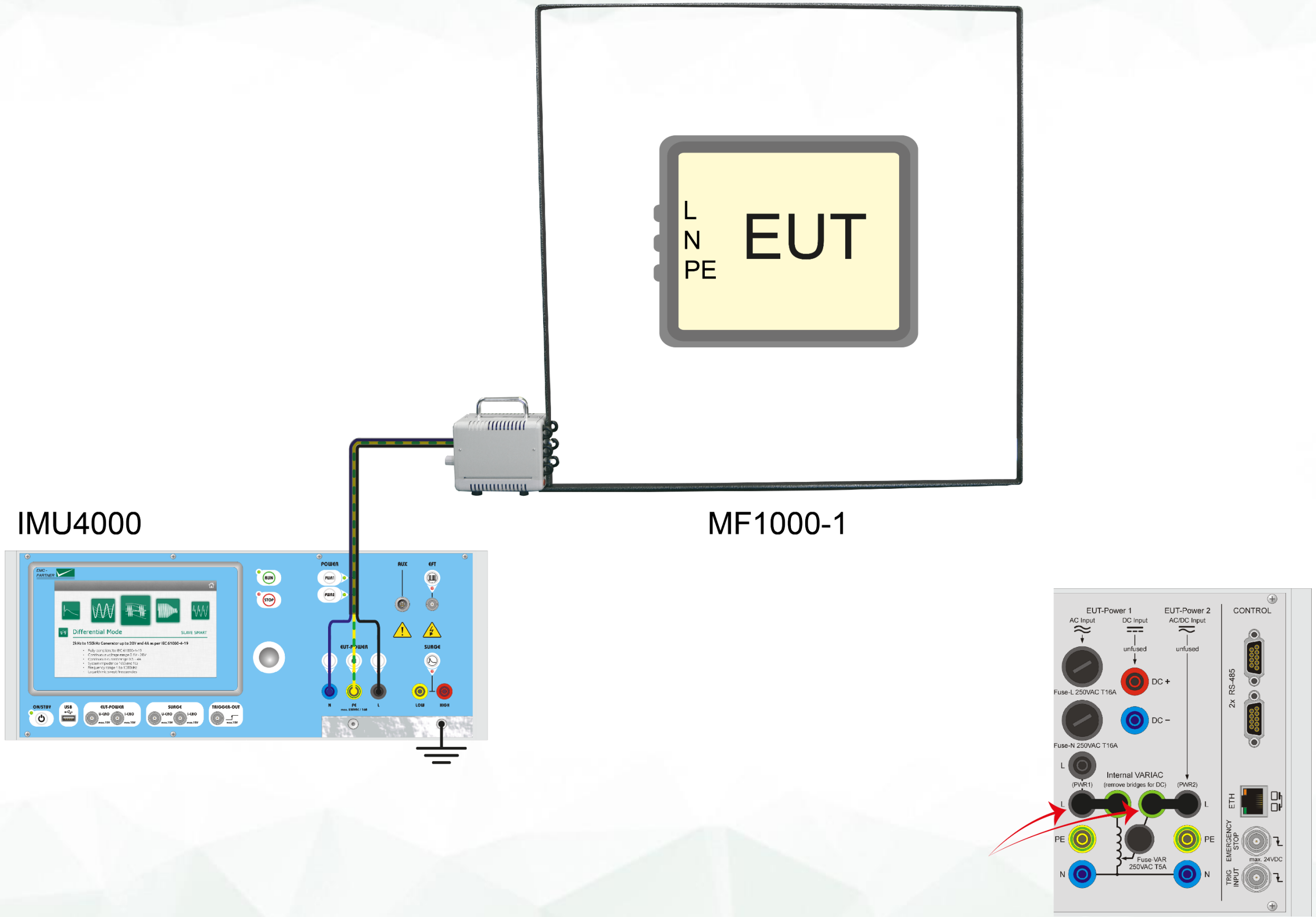
- * Norm levels achievable with the internal 5A variac
- * Improved safety
- * No high current cables from external transformer to the antenna
- * Limitation of human body exposure to magnetic fields during test

1.4.1. Magnetic field 50/60 Hz: IMU4000 V, MF1000-1, calibration setup



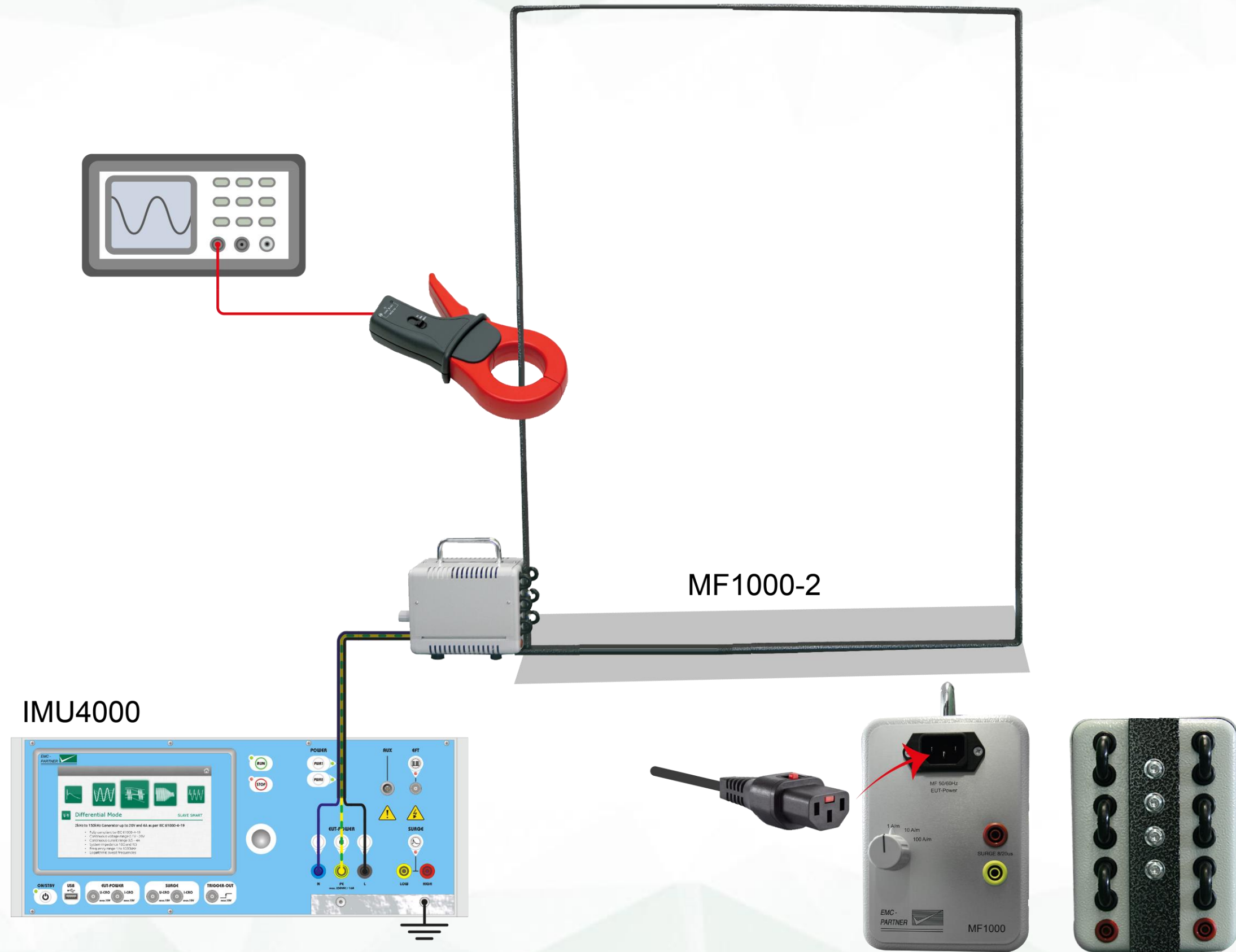
One winding antenna, calibration is possible with a current clamp.

1.4.2. Magnetic field 50/60 Hz: IMU4000 V, MF1000-1, test setup



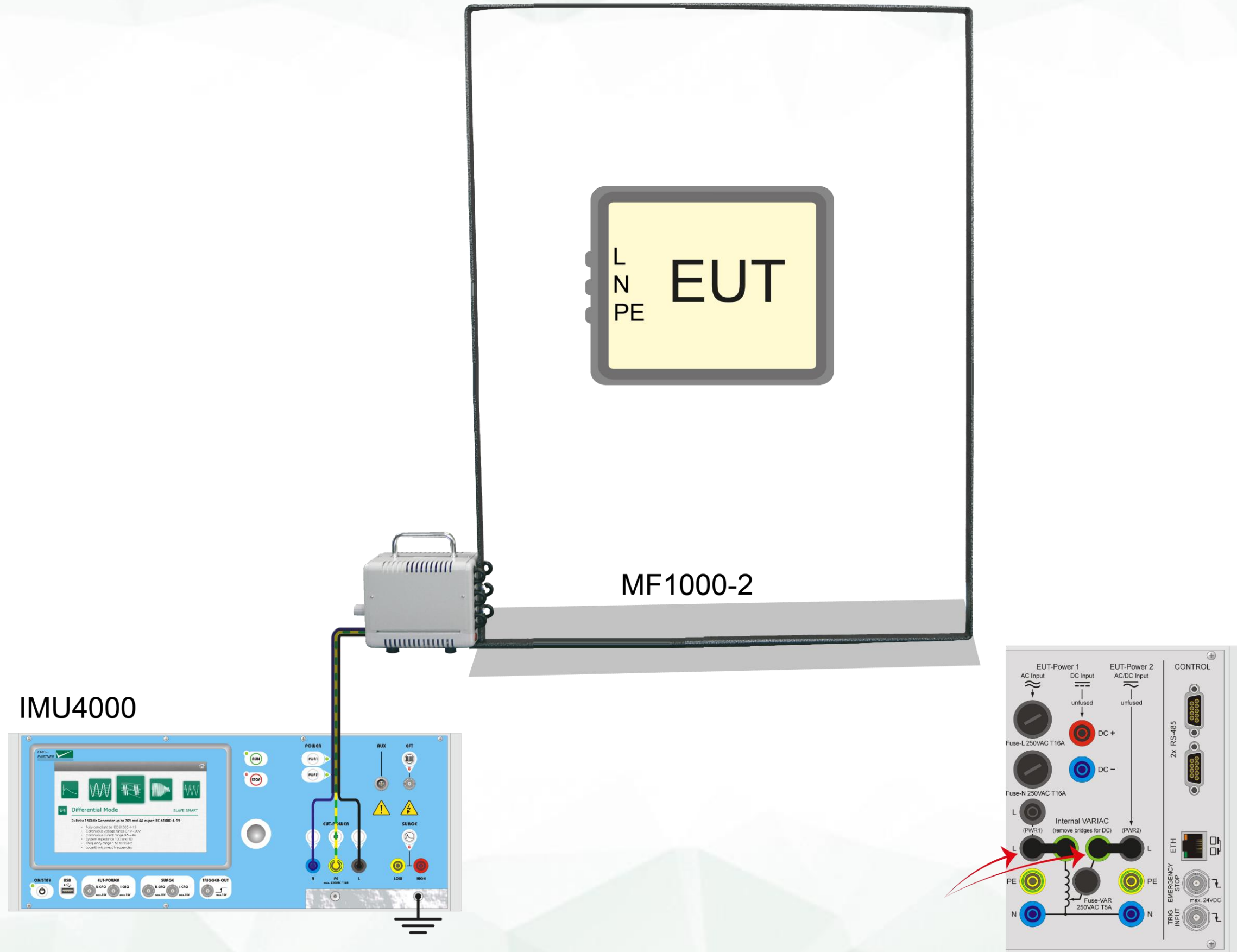
Alternative to internal variac, VAR-EXT1000 can be successfully utilized. With MF1000-1, continuous field strength up to 160 A/m can be reached.

1.4.3. Magnetic field 50/60 Hz: IMU4000 V, MF1000-2, calibration setup



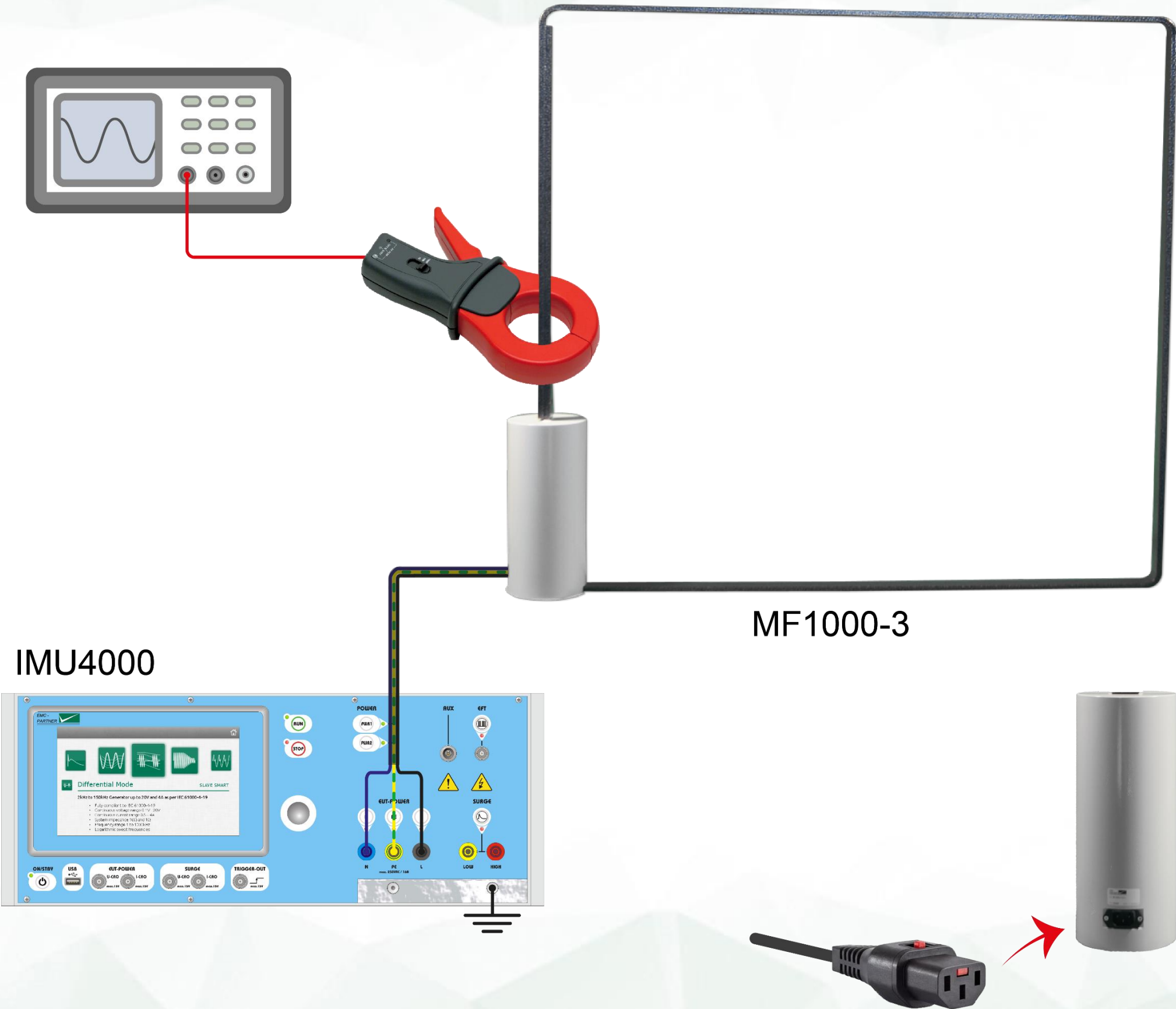
One winding antenna (1 m x 2.6 m), calibration is possible with a current clamp.

1.4.4. Magnetic field 50/60 Hz: IMU4000 V, MF1000-2, test setup



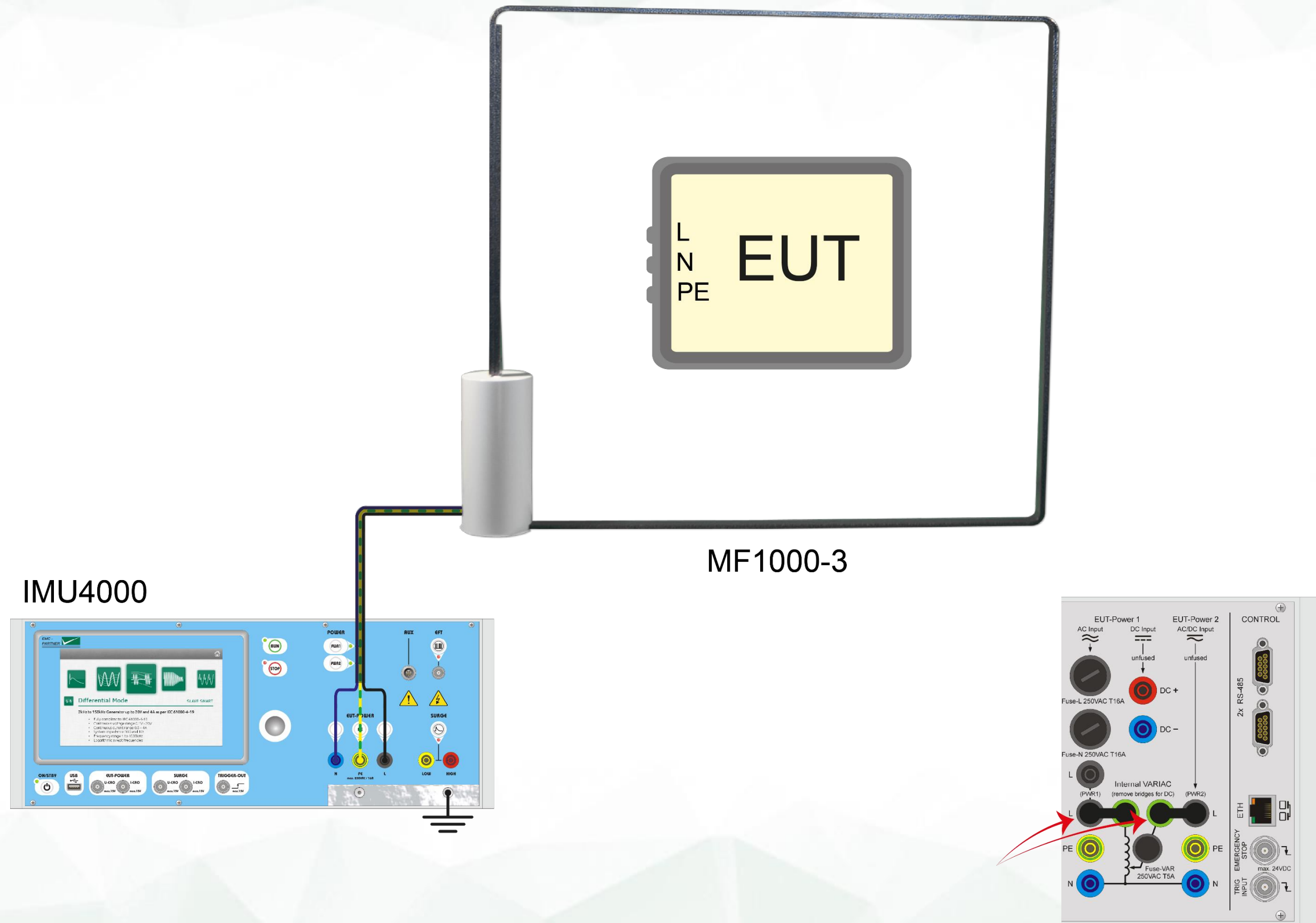
With MF1000-2, continuous field strength up to 110 A/m can be reached (but larger EUTs can be tested in comparison to MF1000-1).

1.4.5. Magnetic field 50/60 Hz: IMU4000 V, MF1000-3, calibration setup



One winding antenna, calibration is possible with a current clamp.

1.4.6. Magnetic field 50/60 Hz: IMU4000 V, MF1000-3, test setup

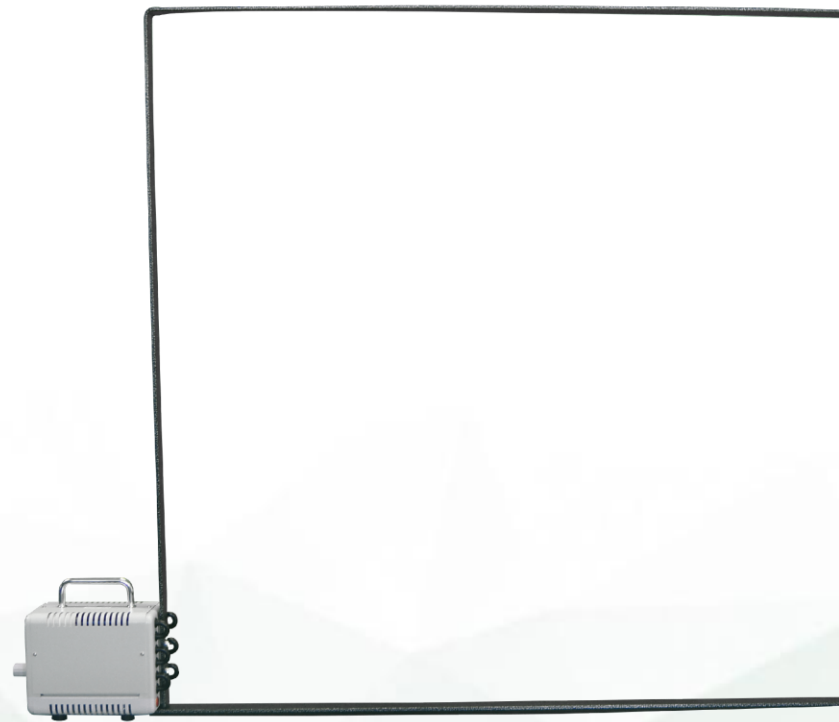


MF1000-3: *continuous* field strength 150 A/m – 500 A/m with either internal or external variac, *short term*: 150 A/m – 1100 A/m with both variacs.

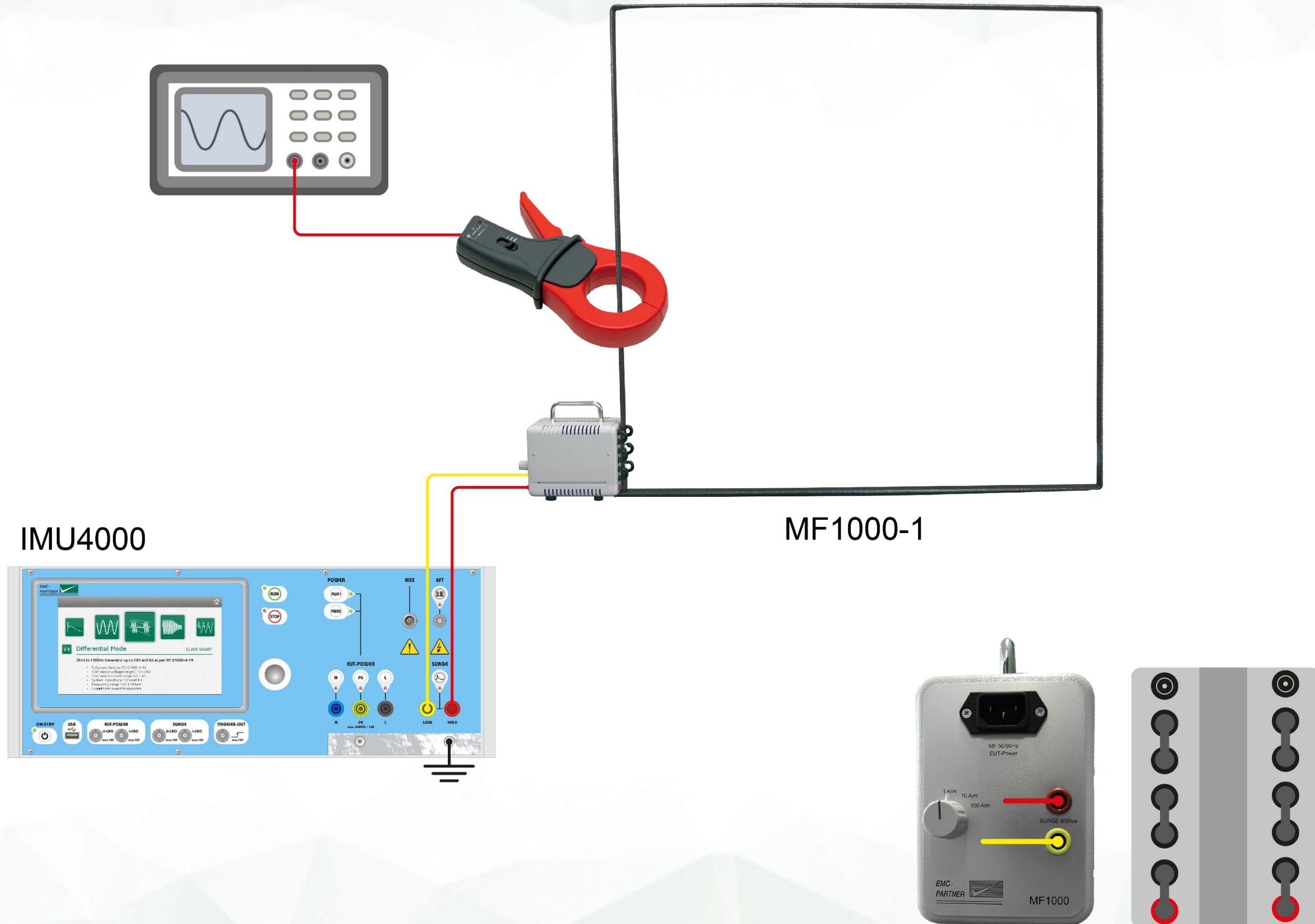
1.5. Magnetic pulse calibration and test setup as per IEC 61000-4-9 latest edition

IEC 61000-4-9
Edition 1.1 + AMD1 / 2008

Magnetic field pulse up to 1000 A/m
with MF1000-1 or MF1000-2

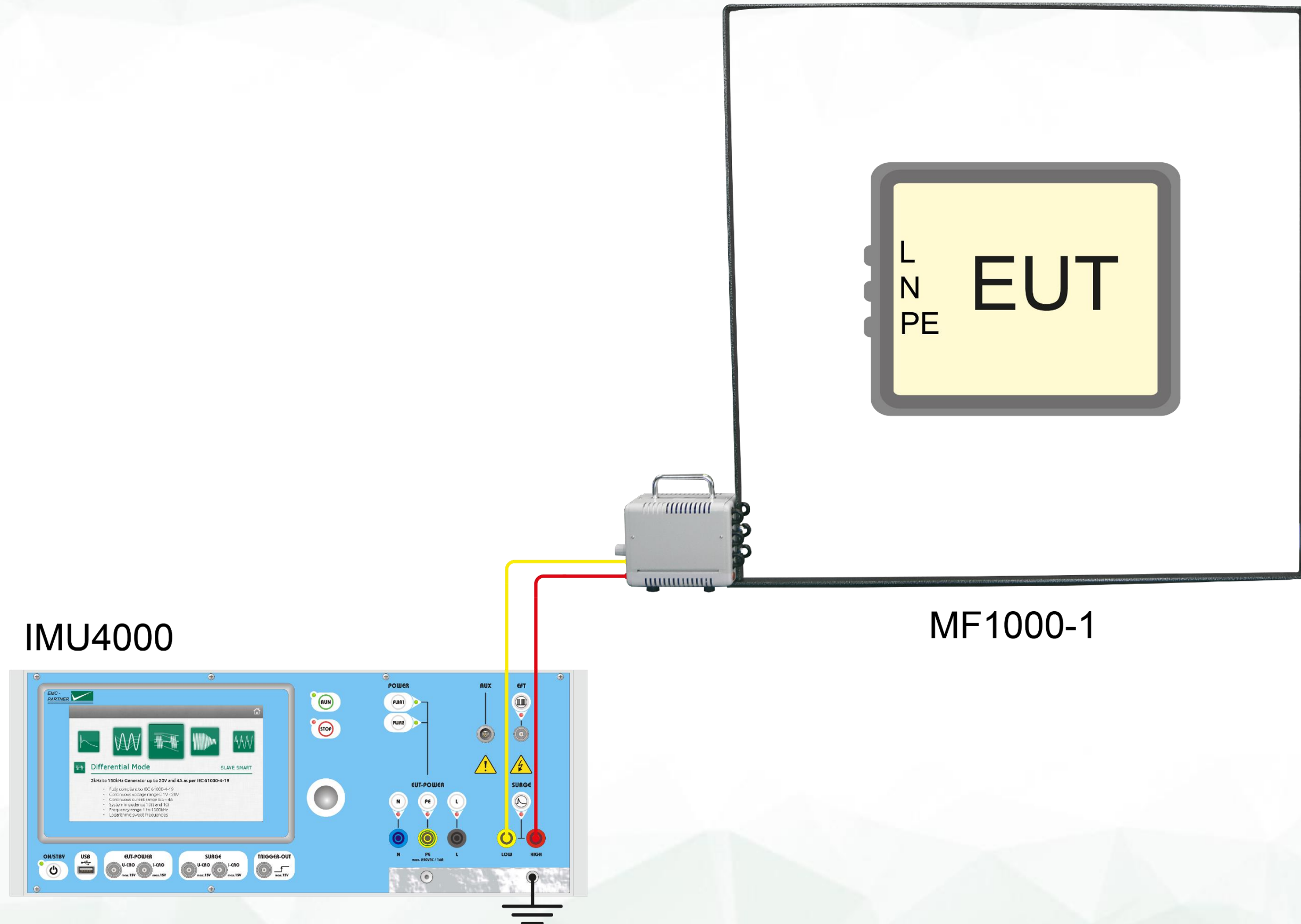


1.5.1. Magnetic pulse: IMU4000 S, MF1000-1, calibration setup



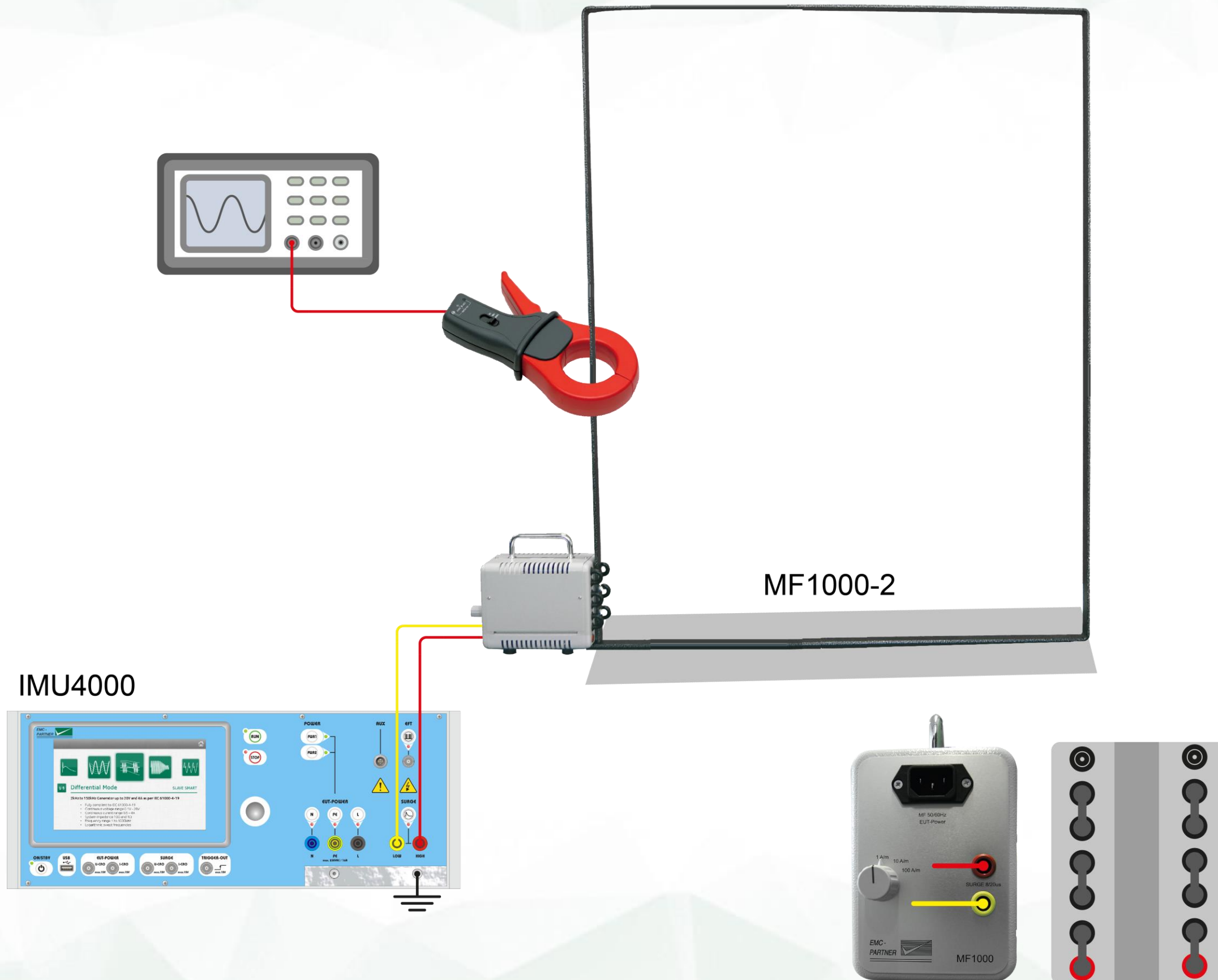
Magnetic pulse antenna is connected to direct surge output. Bridges on the antenna have to be connected as described.

1.5.2. Magnetic pulse: IMU4000 S, MF1000-1, test setup



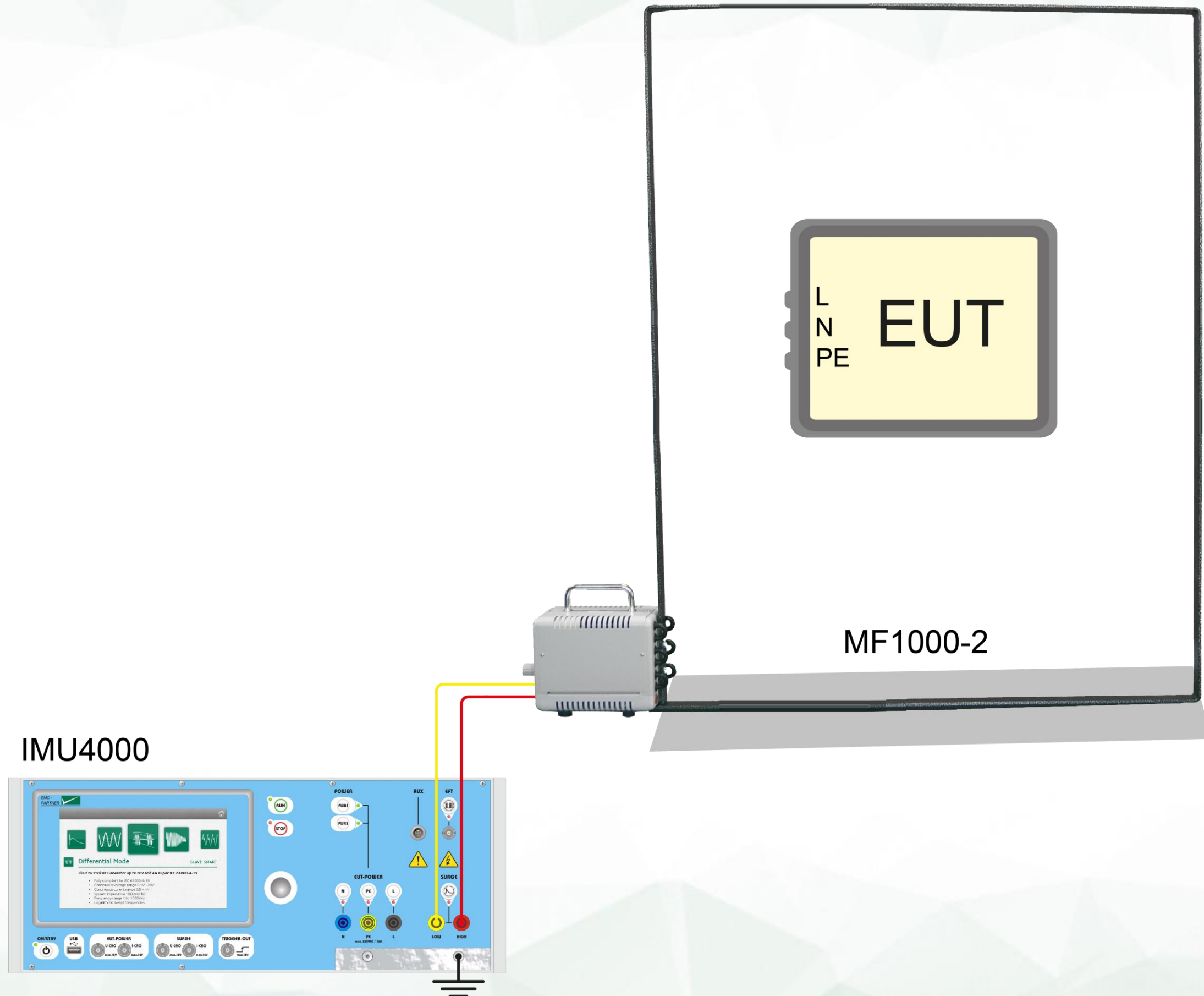
With MF1000-1, pulses in the range 90 A/m – 1400 A/m can be reached.

1.5.3. Magnetic pulse: IMU4000 S, MF1000-2, calibration setup



Magnetic pulse antenna is connected to direct surge output. Bridges on the antenna have to be connected as described.

1.5.4. Magnetic pulse: IMU4000 S, MF1000-2, test setup



With MF1000-2, pulses in the range 63 A/m – 1025 A/m can be reached (but larger EUTs can be tested in comparison to MF1000-1).

1.6. Interruptions, dips and variations: calibration and test setup as per IEC61000-4-11 (IEC61000-4-34 also) latest edition

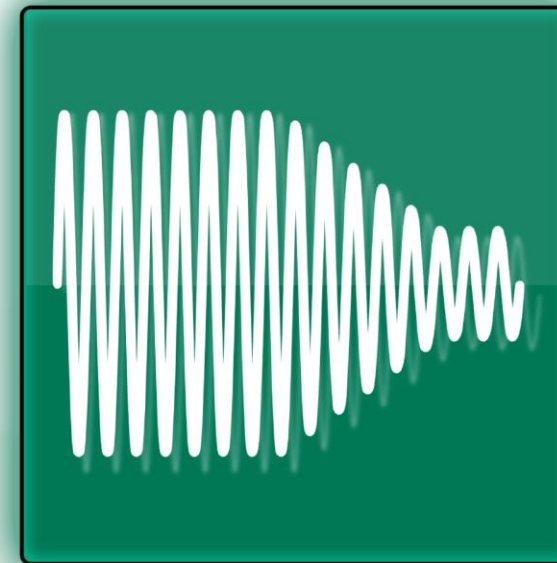
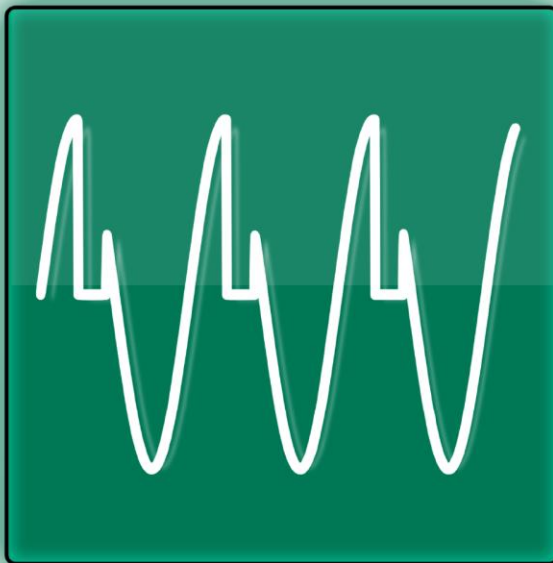
IEC 61000-4-11
Edition 2.0 / 2004

IEC 61000-4-34
Edition 1.0 + AMD1 / 2009

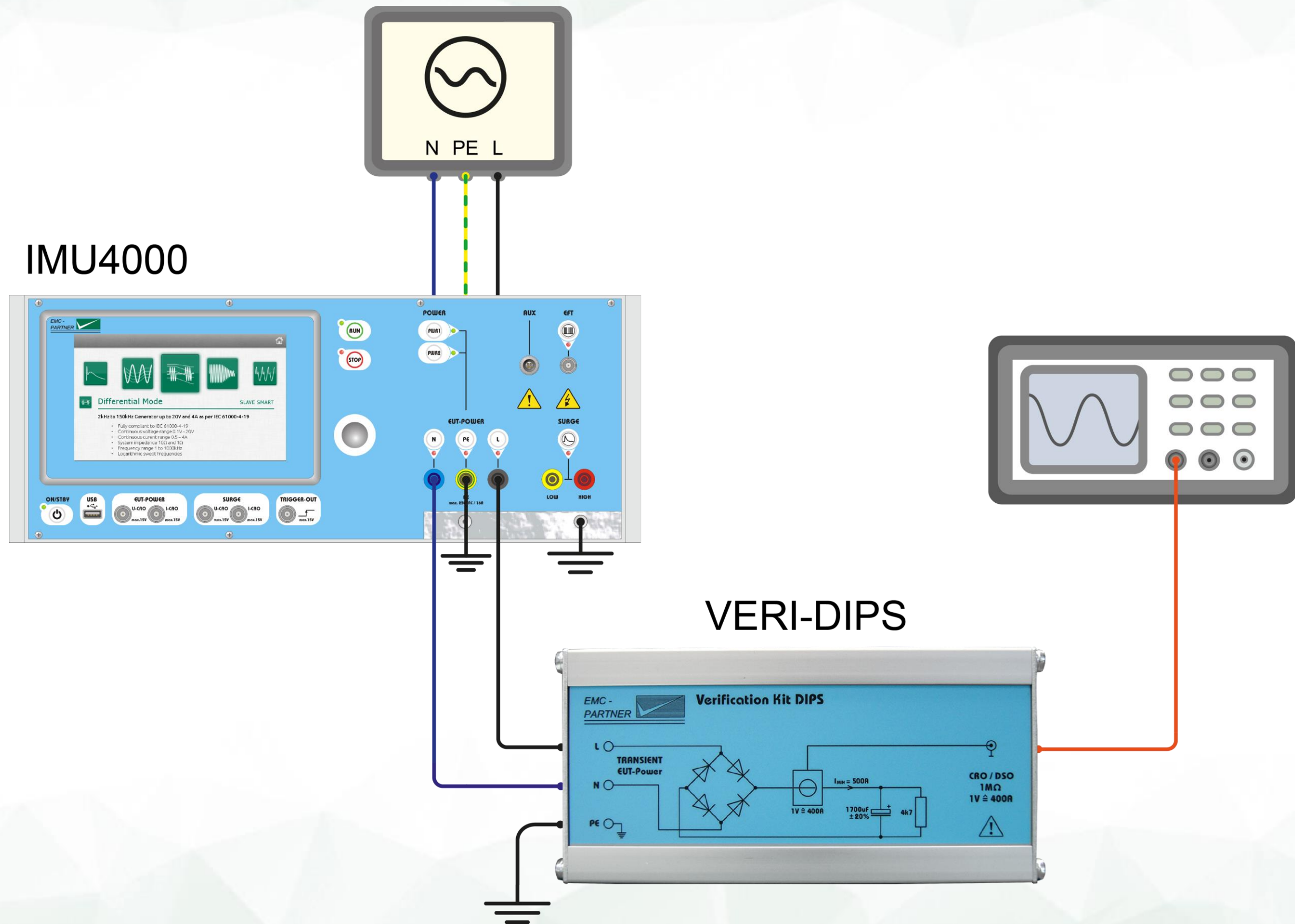
EUT current < 16 A

16 A < EUT current < 75 A

Dips, interruptions and variations
on power supply lines

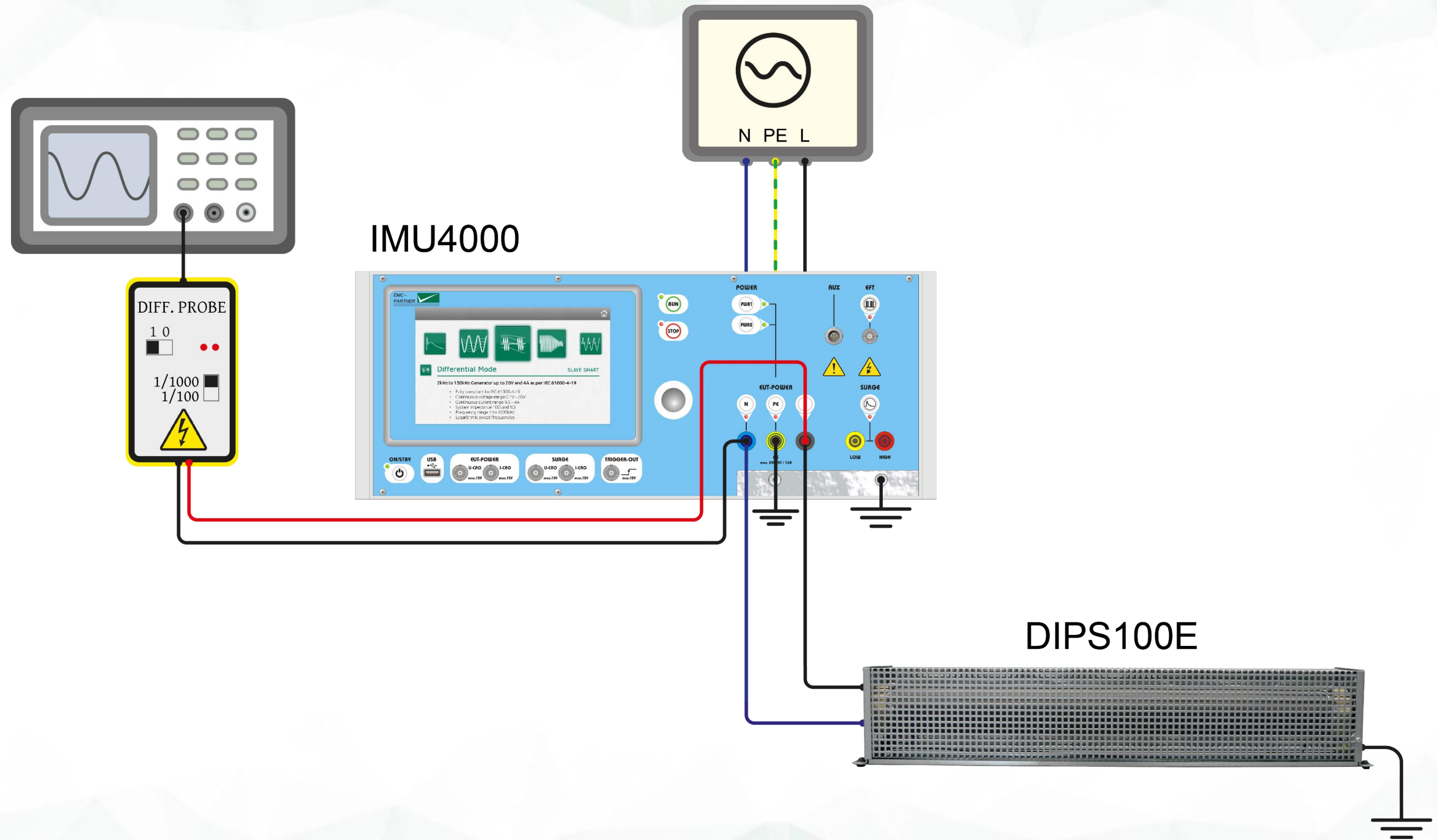


1.6.1. Int., dips, var.: IMU4000 D-V (internal variac 5A), inrush current calibration setup



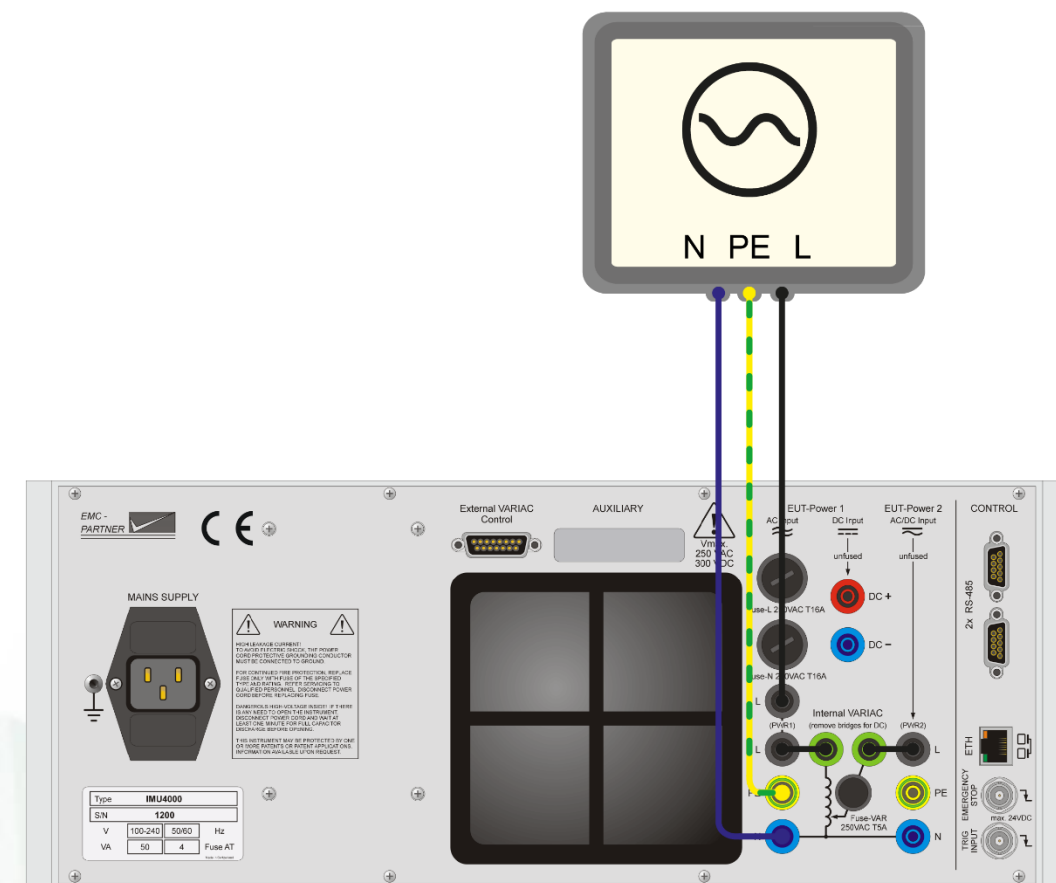
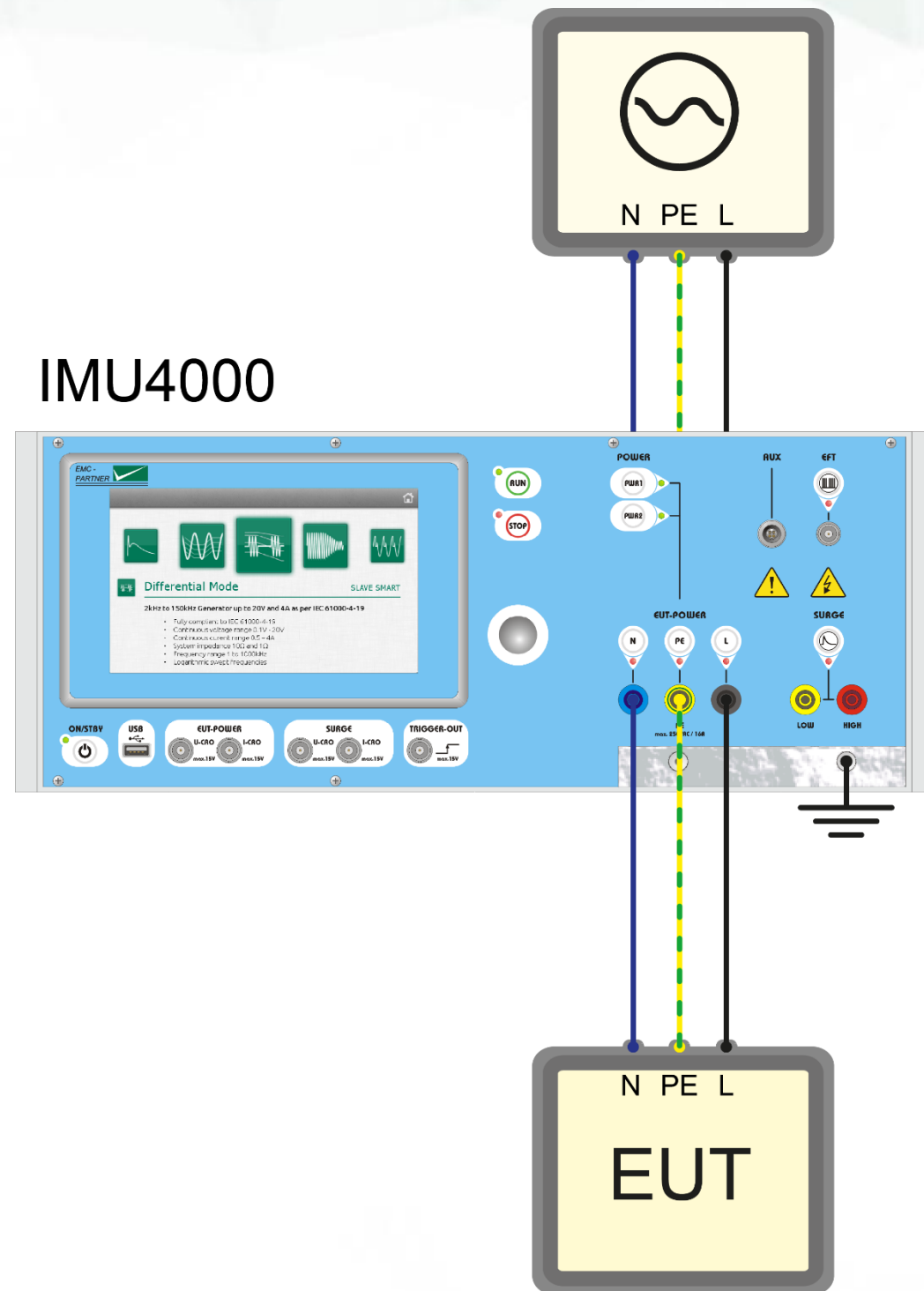
Inrush current is depending also on building's supply network, it should be measured before each test.

1.6.2. Int., dips, var.: IMU4000 D-V (internal variac 5A), switch time calibration setup



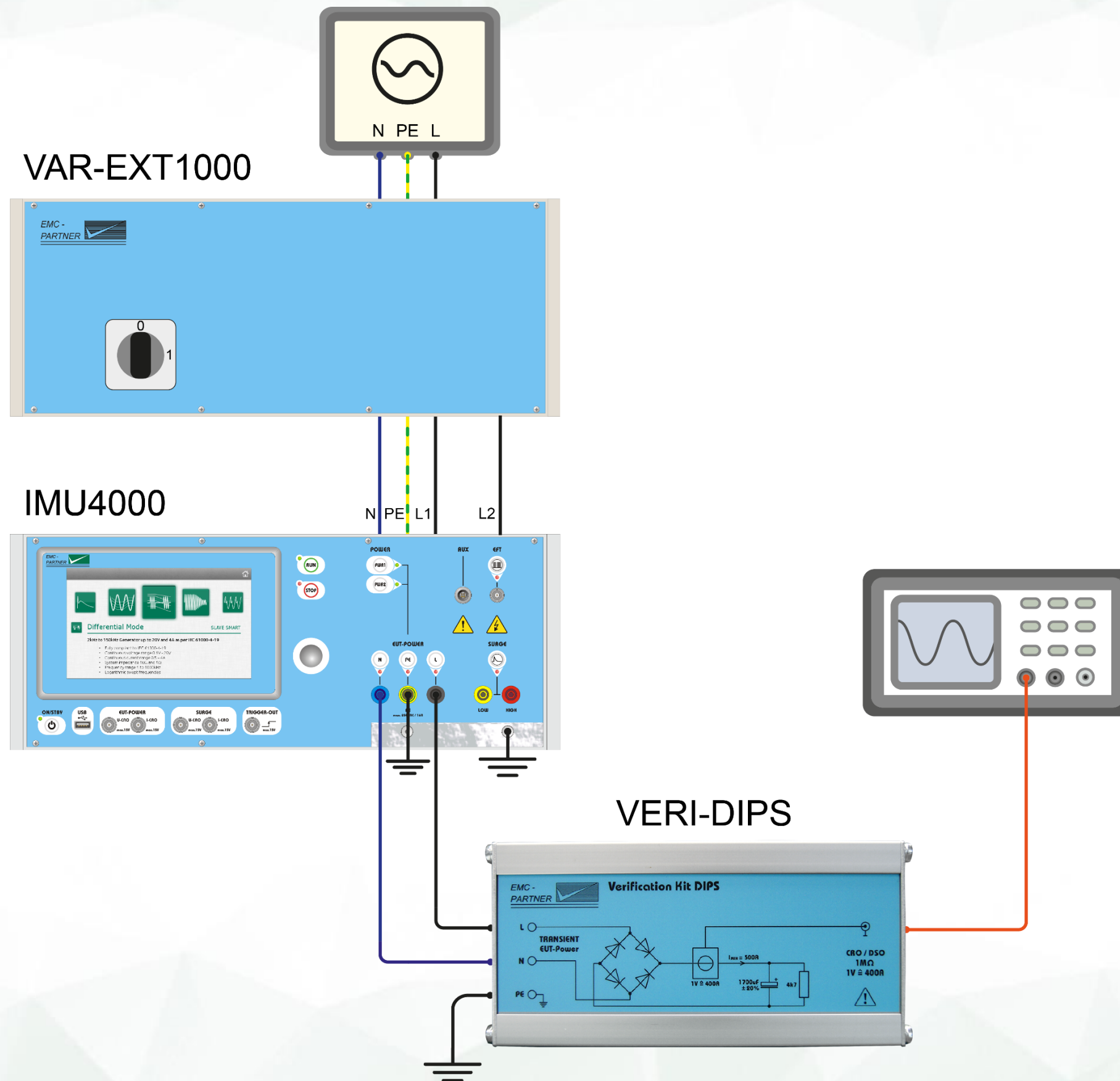
Switching time has to be measured into a $100\ \Omega$ load: $1 \dots 5\ \mu\text{s}$.

1.6.3. Int., dips, var.: IMU4000 D-V (internal variac 5A), test setup



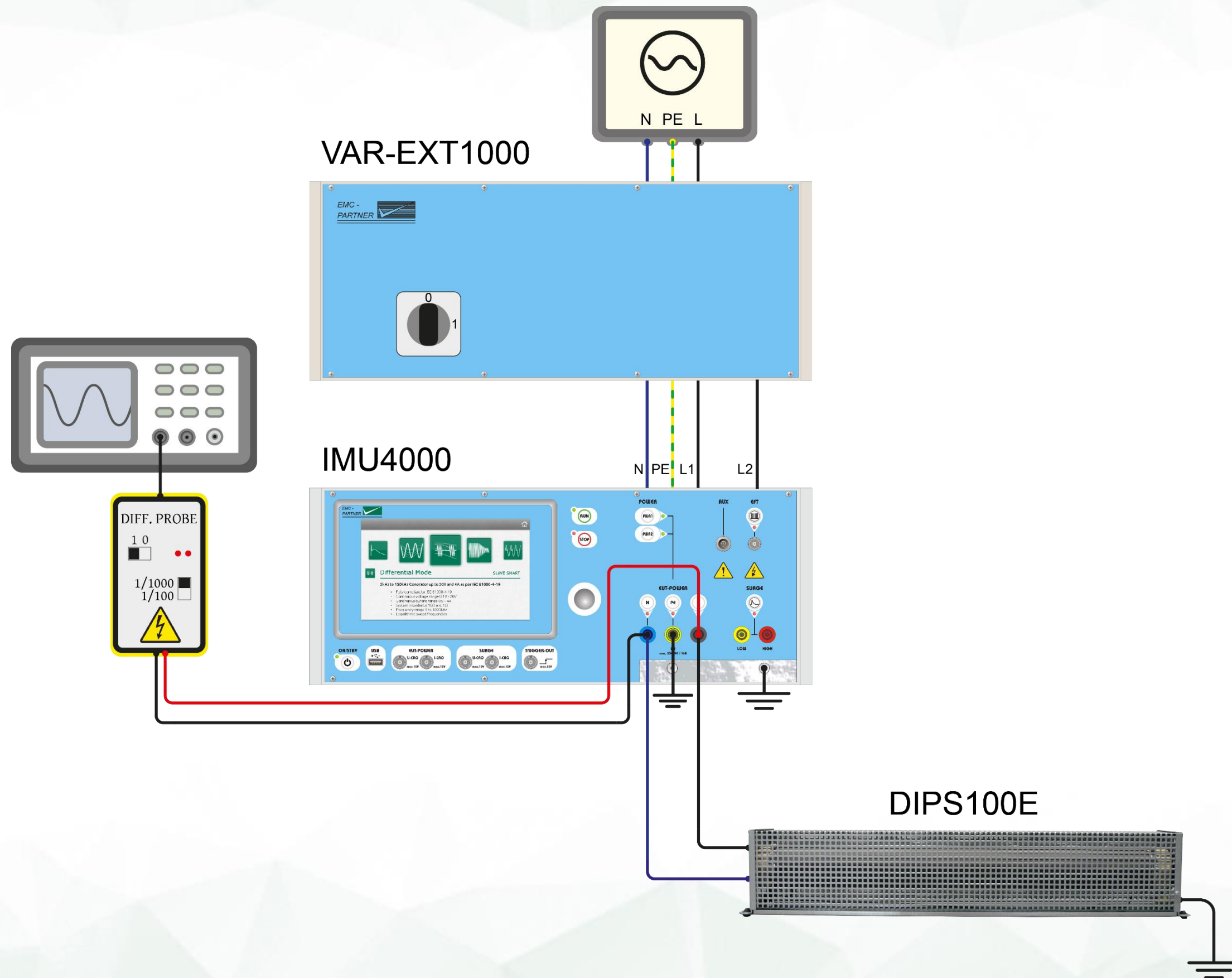
Bridges have to be connect correspondingly on the back panel of the generator (also during calibration).

1.6.4. Int., dips, var.: IMU4000 D, VAR-EXT1000 (16A), inrush current calibration setup



Inrush current is depending also on building's supply network, it should be measured before each test.

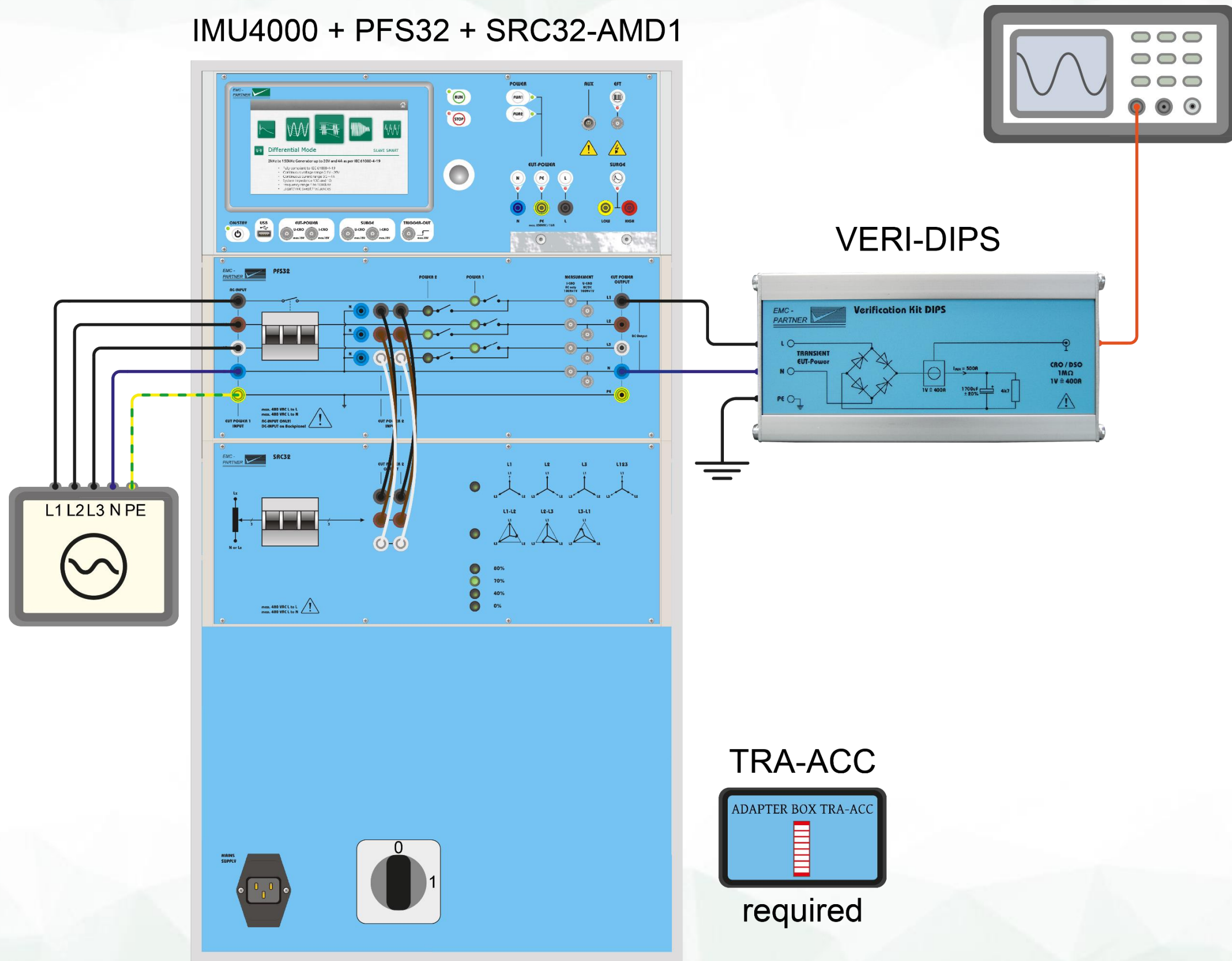
1.6.5. Int., dips, var.: IMU4000 D, VAR-EXT1000 (16A), switch time calibration setup



Switching time has to be measured into a 100 Ω load: 1...5 μ s.

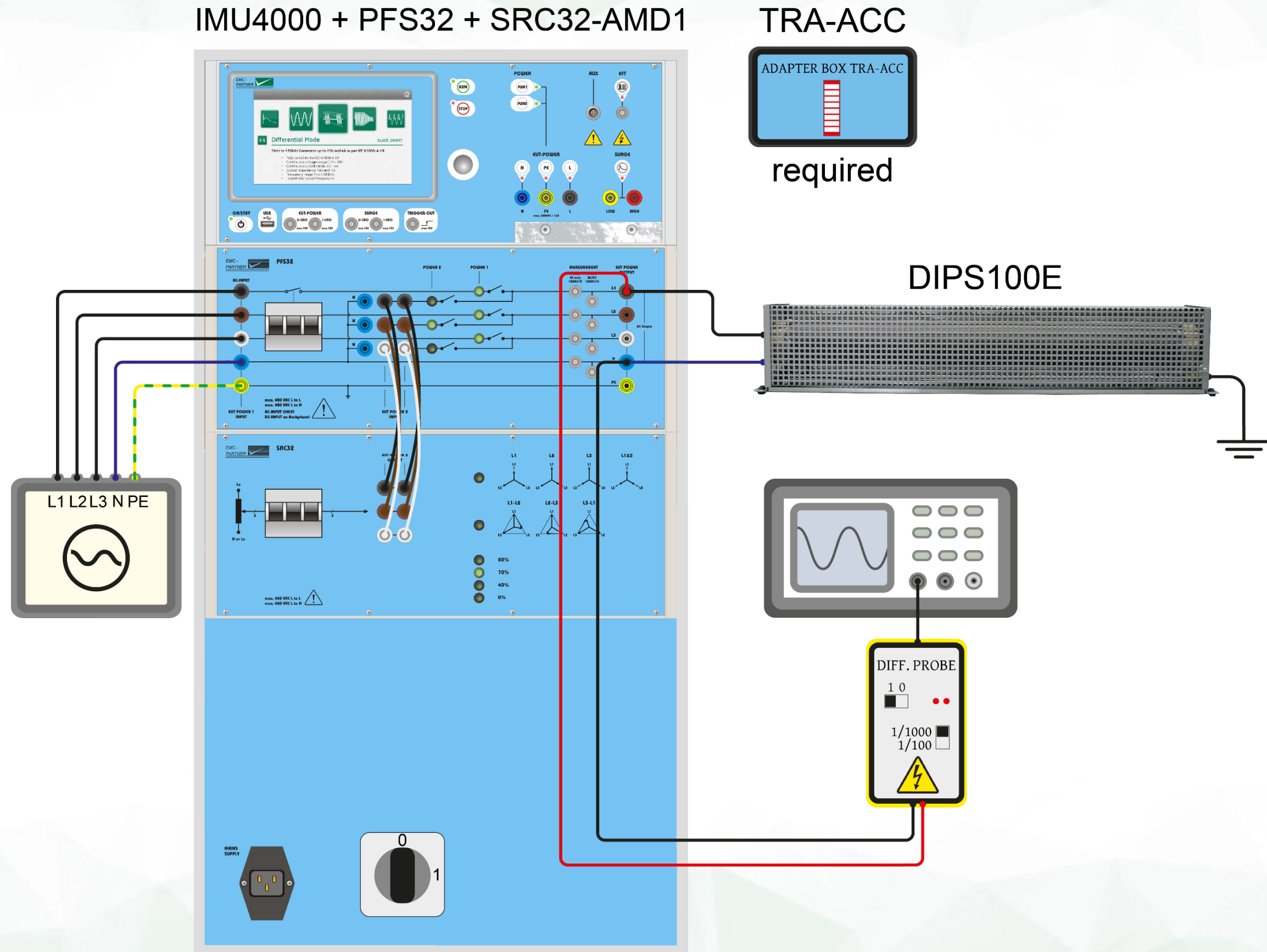
1.6.7. Int., dips, var.: IMU4000 D, PFS 32, SRC32-AMD1 (also valid for PFS63+SRC63 and PFS75+SRC75 all models), inrush current calibration setup

IMU4000 + PFS32 + SRC32-AMD1



All coupling paths are calibrated successively.

1.6.8. Int., dips, var.: IMU4000 D, PFS 32, SCR32-AMD1 (also valid for PFS63+SRC63 and PFS75+SRC75 all models), switch time calibration setup

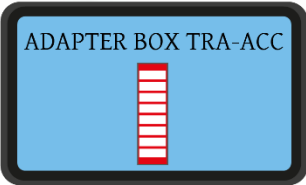


Switching time has to be measured into a 100 Ω load: 1...5 μ s.

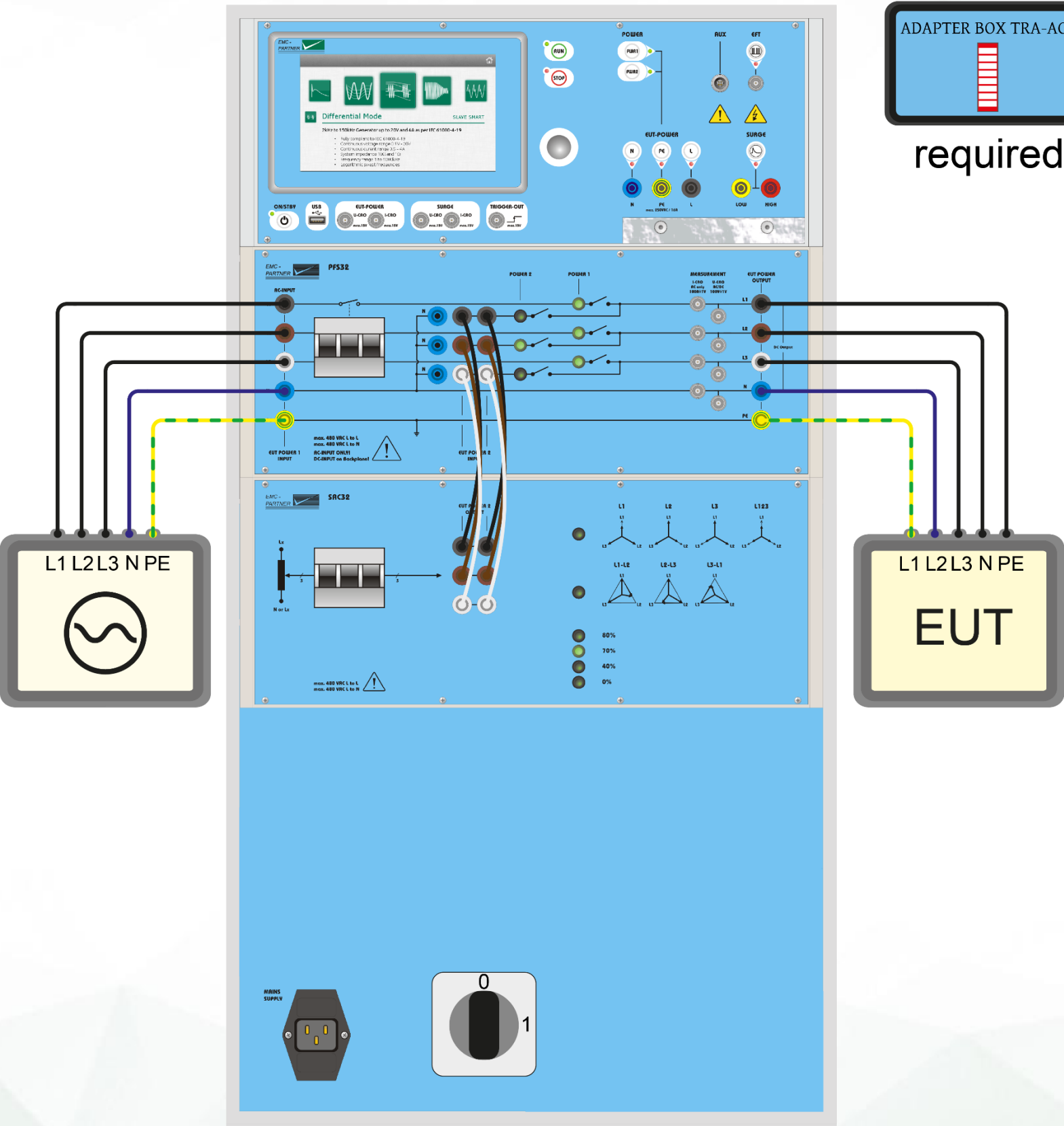
1.6.9. Int., dips, var.: IMU4000 D, PFS 32, SCR32-AMD1 (also valid for PFS63+SRC63 and PFS75+SRC75 all models), test setup

IMU4000 + PFS32 + SRC32-AMD1

TRA-ACC

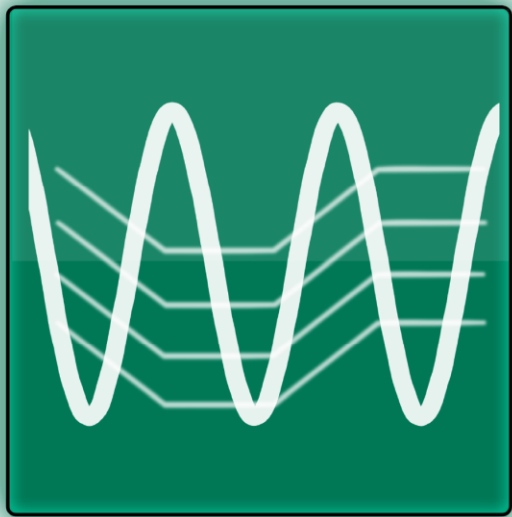


required

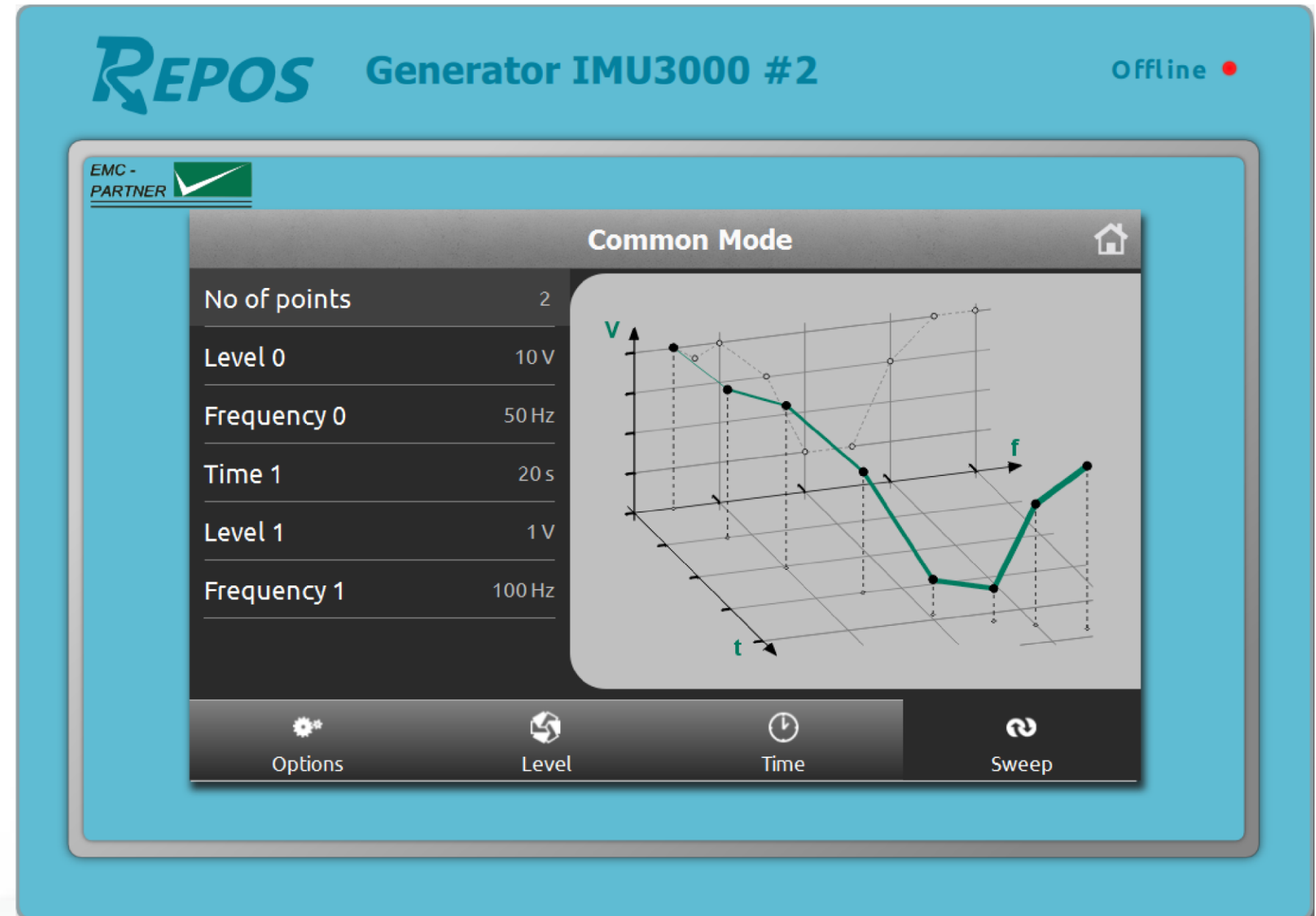


Synchronization possible for both star and delta connections.

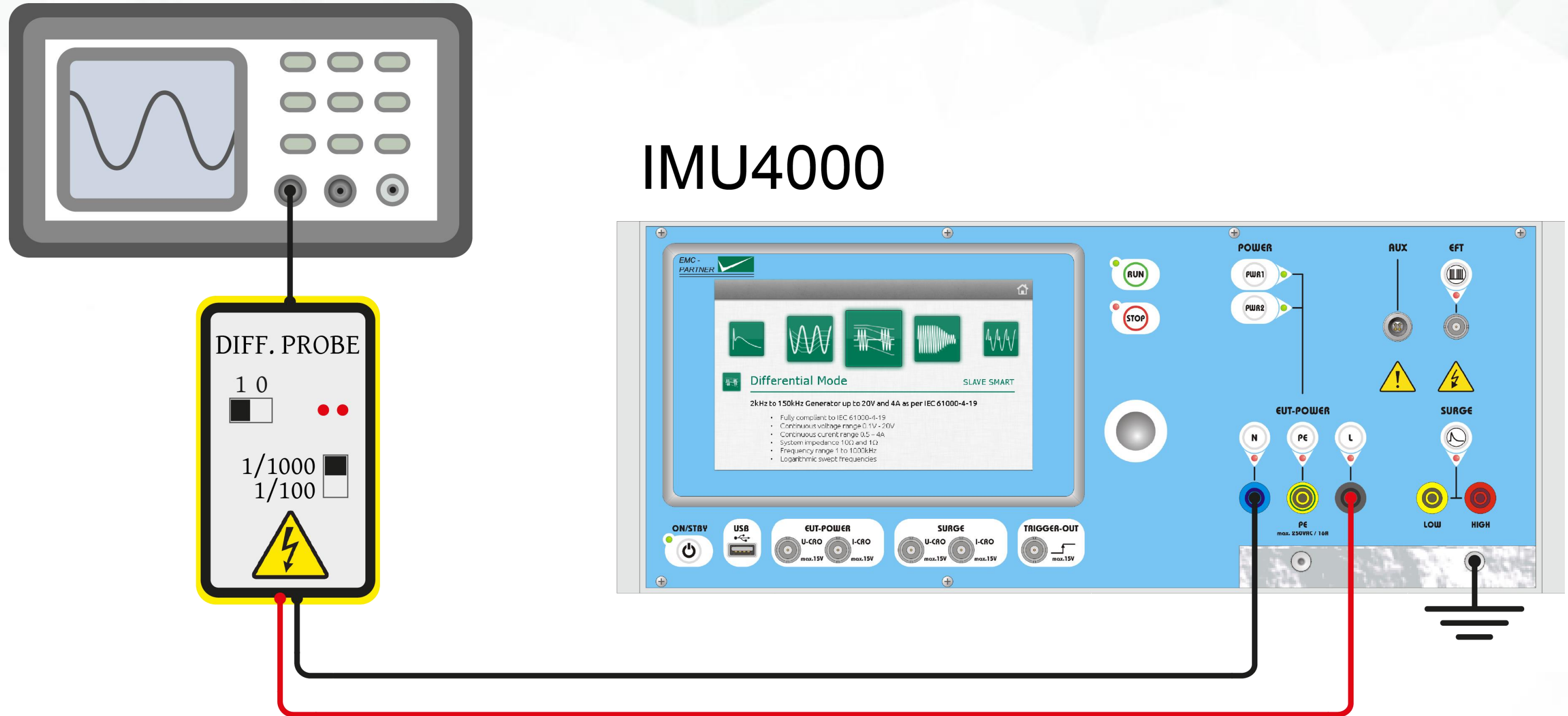
IEC 61000-4-16 Edition 1.1 +AMD1 / 2002



Common mode disturbances



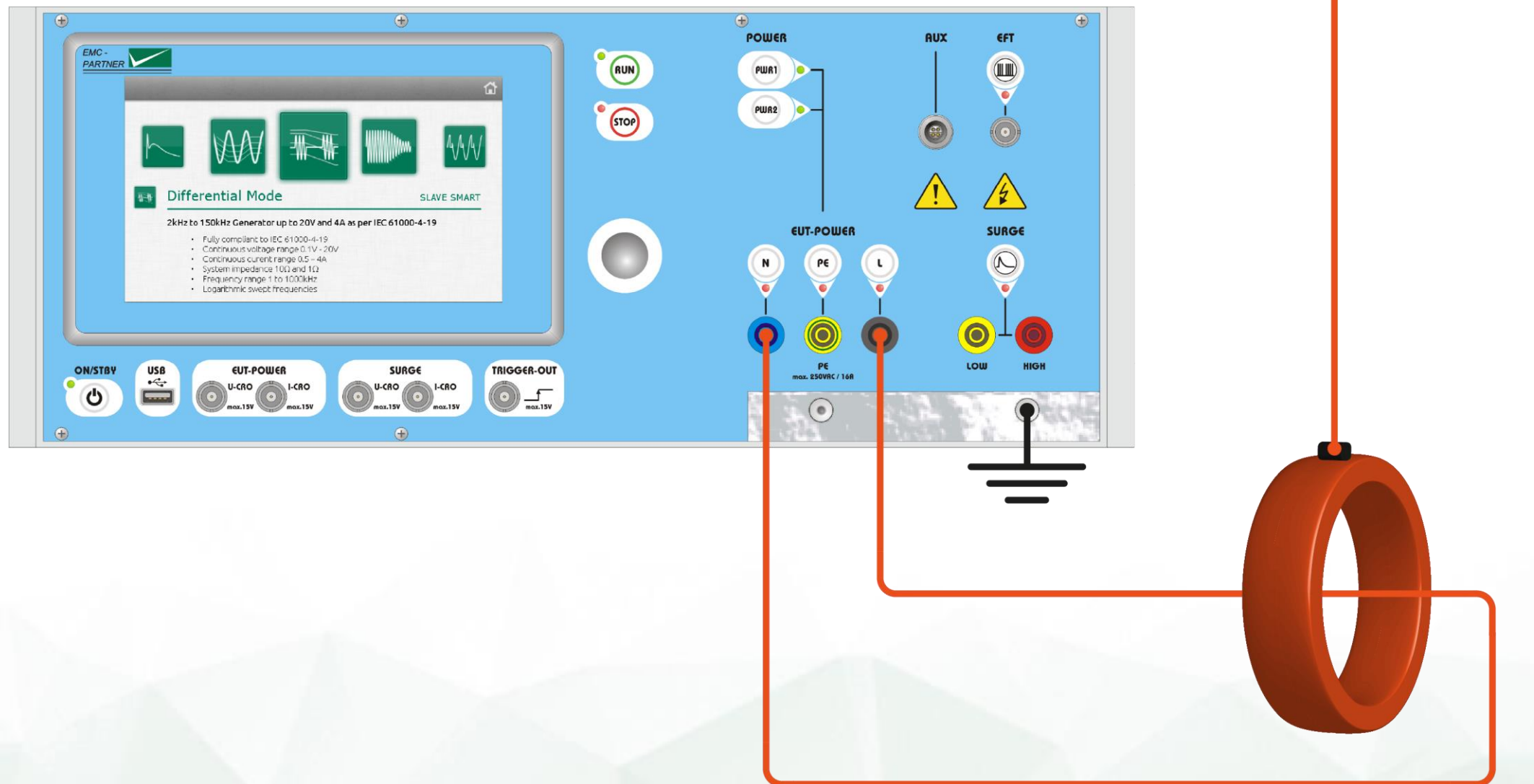
1.7.1. Common mode: IMU4000 C, voltage calibration setup up to 30V



Calibration is performed at output of the generator, CDN is not part of the calibration setup.

1.7.2. Common mode: IMU4000 C, current (impedance) calibration setup up to 30V

IMU4000

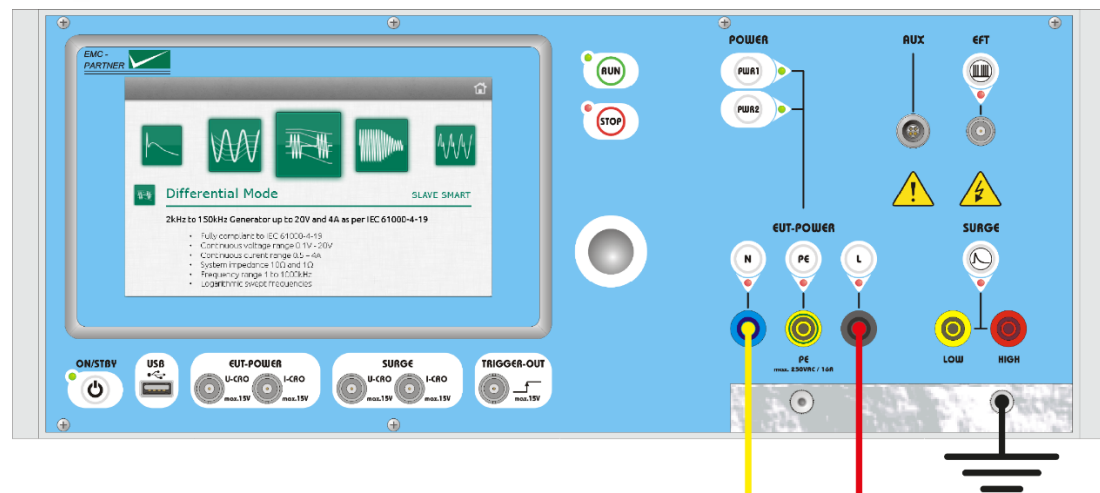


Short circuit current can be measured in order to check output impedance.

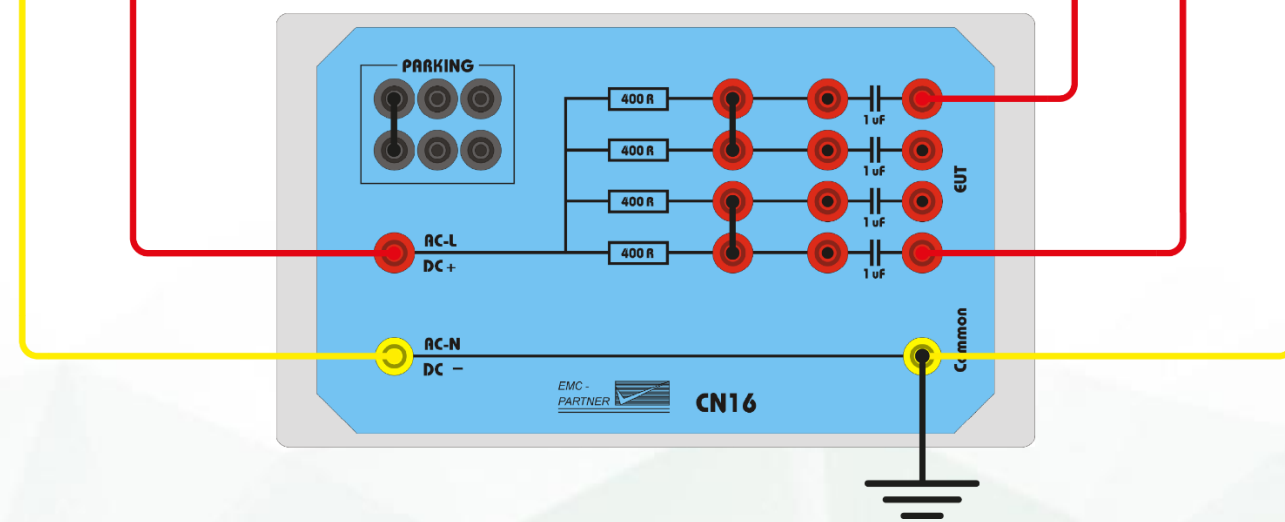
1.7.3. Common mode: IMU4000 C, CN16, test setup up to 30V



IMU4000

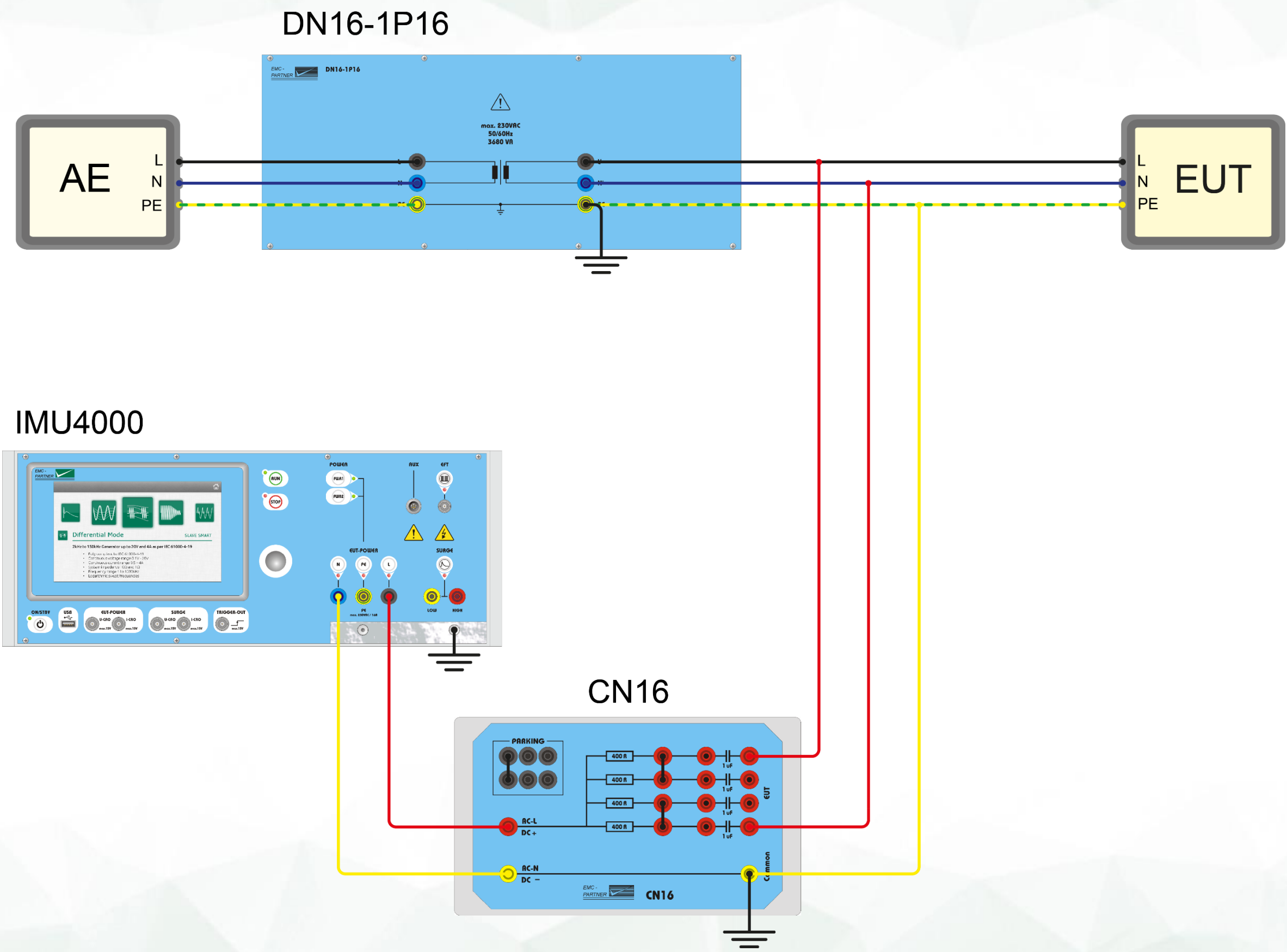


CN16



Decoupler could be DN16-1P6, DN16-1P16 or another suitable device calibrated according to standard. Coupling on 4 lines also possible.

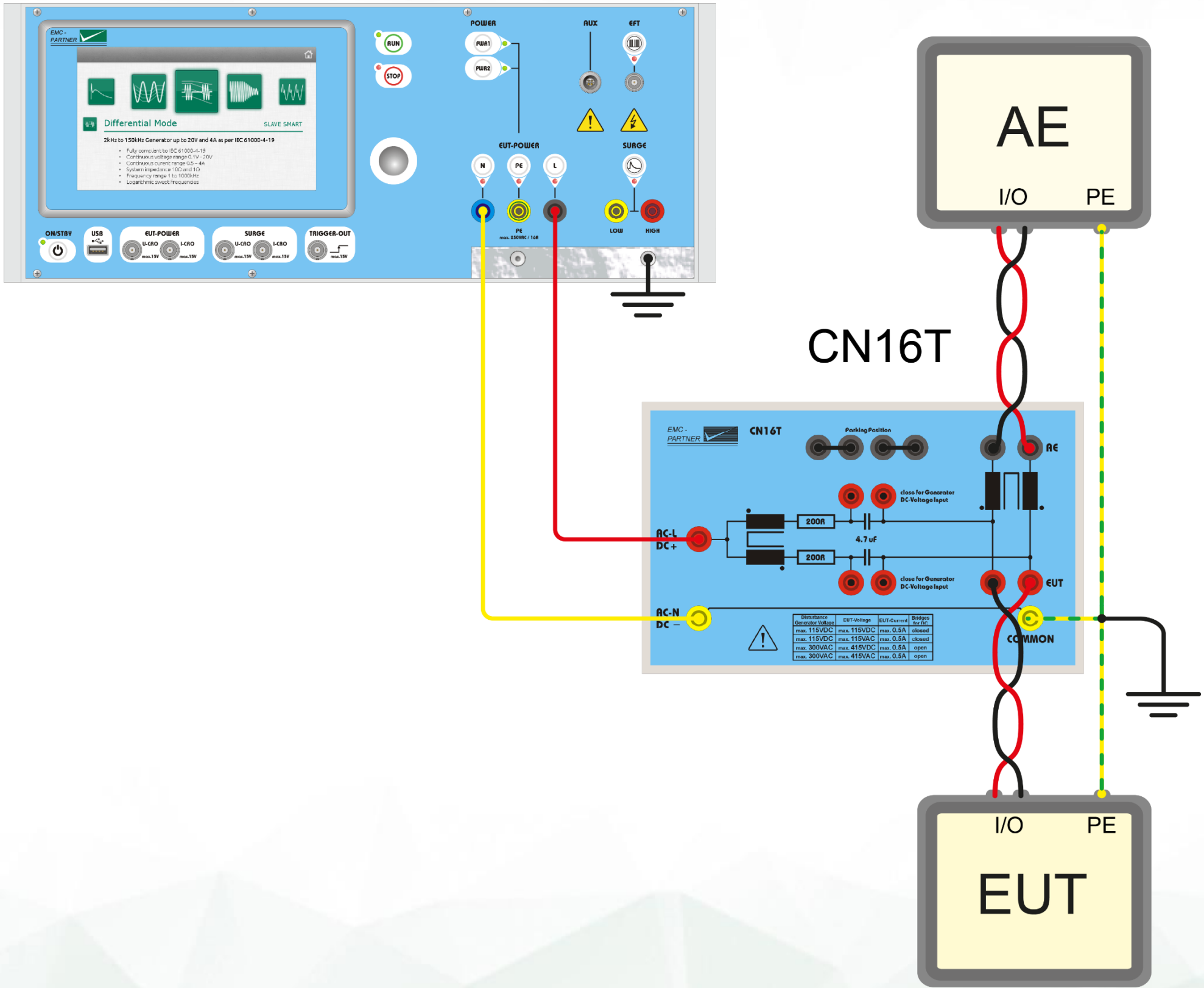
1.7.4. Common mode: IMU4000 C, CN16, DN16-1P16 (or DN16-1P6), test setup up to 30V



DN16-1P6 and DN16-1P16: common mode decoupling > 60 dB, insulation > 1 kV.

1.7.5. Common mode: IMU4000 C, CN16T, test setup up to 30V

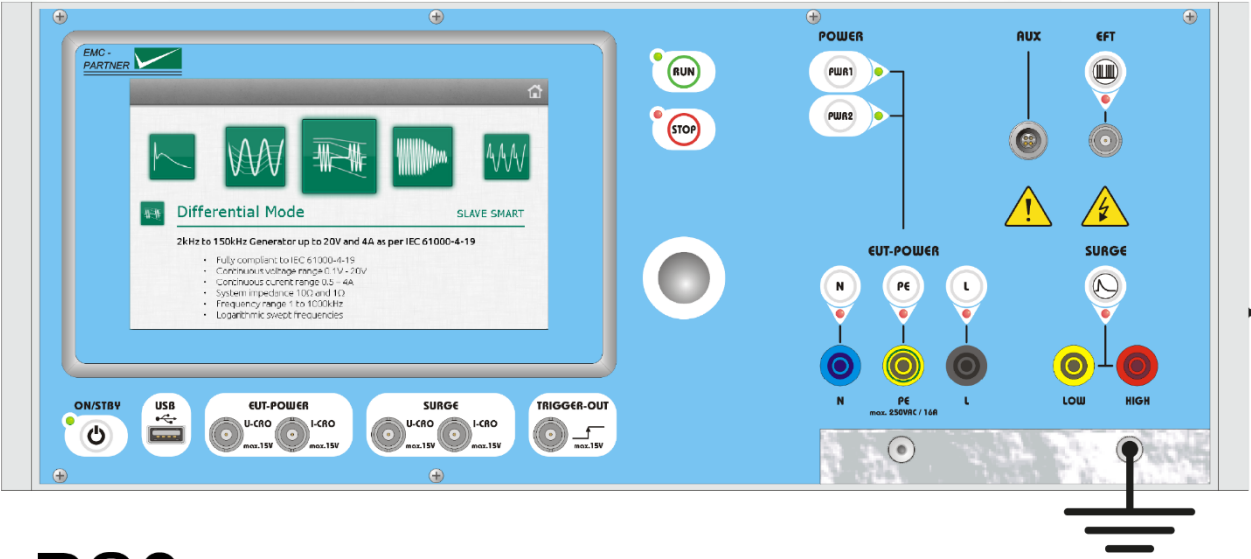
IMU4000



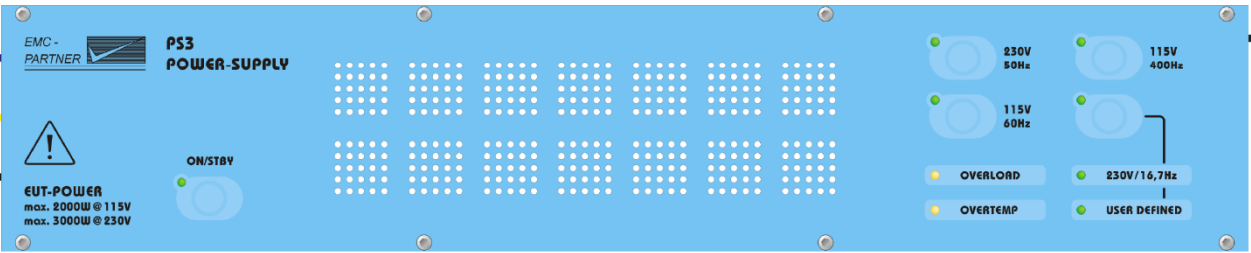
Capacitors have to be bypassed when coupling DC test signal.

1.7.6. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, voltage calibration setup up to 300V

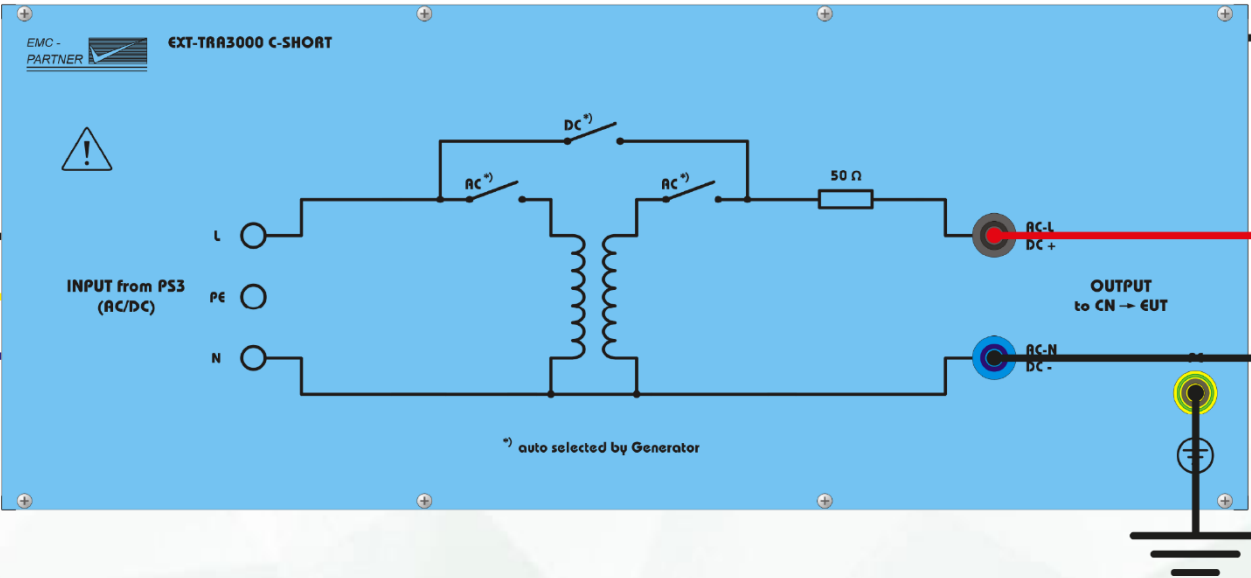
IMU4000



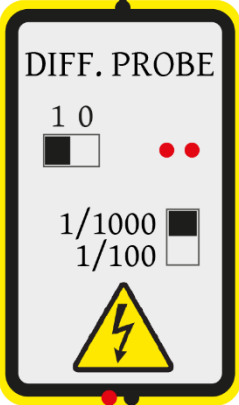
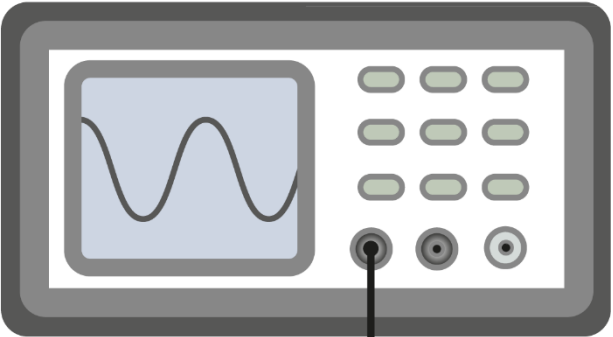
PS3



EXT-TRA3000 C-SHORT



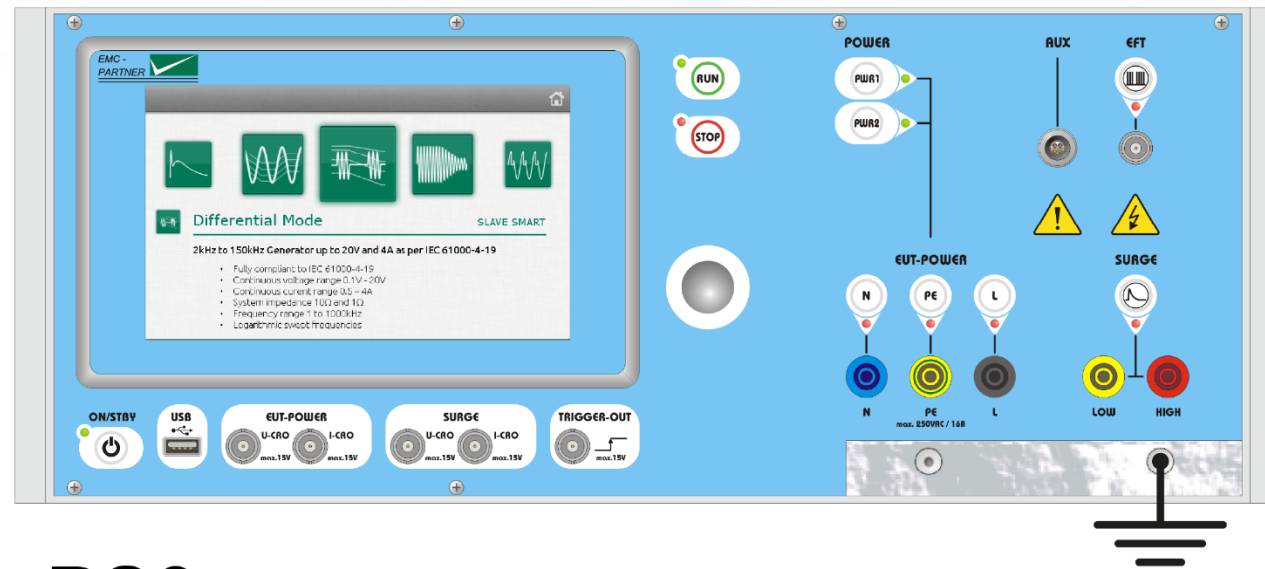
RS485-RS232
ADAPTER



Calibration is performed at output of the generator, CDN is not part of the calibration setup.

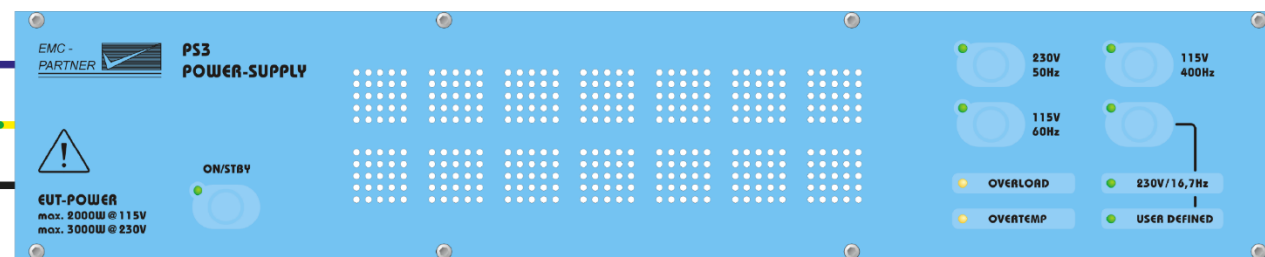
1.7.7. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, current (impedance) calibration setup up to 300V

IMU4000

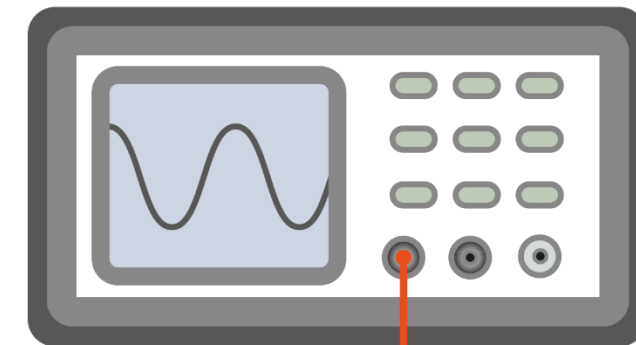
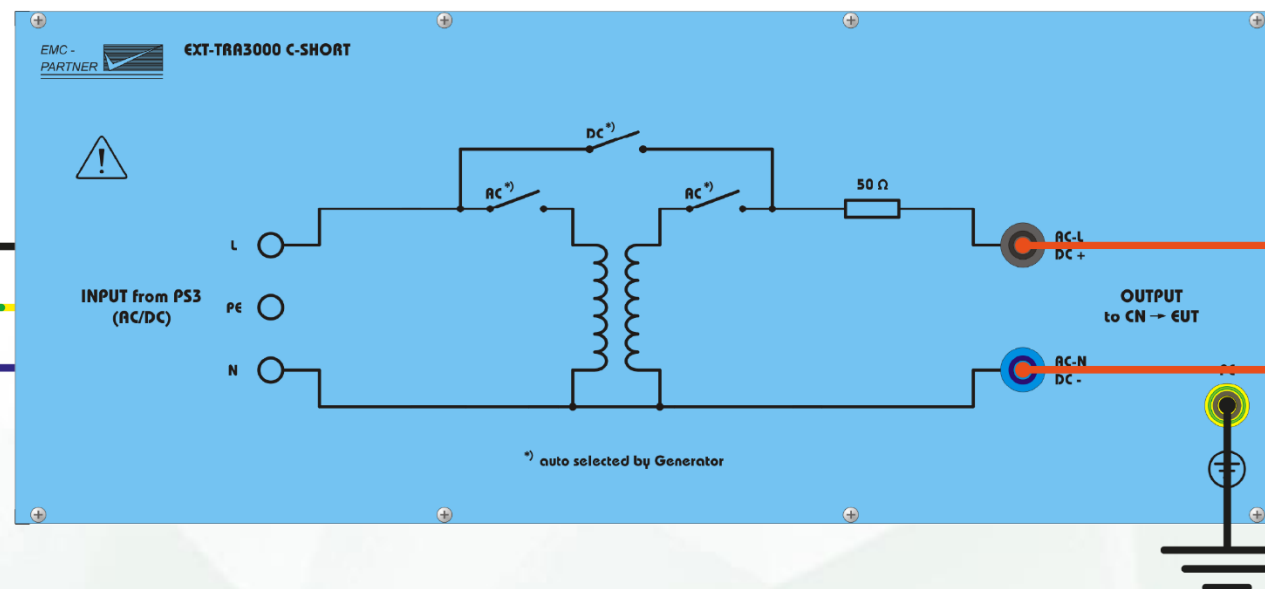


RS485-RS232
ADAPTER

PS3

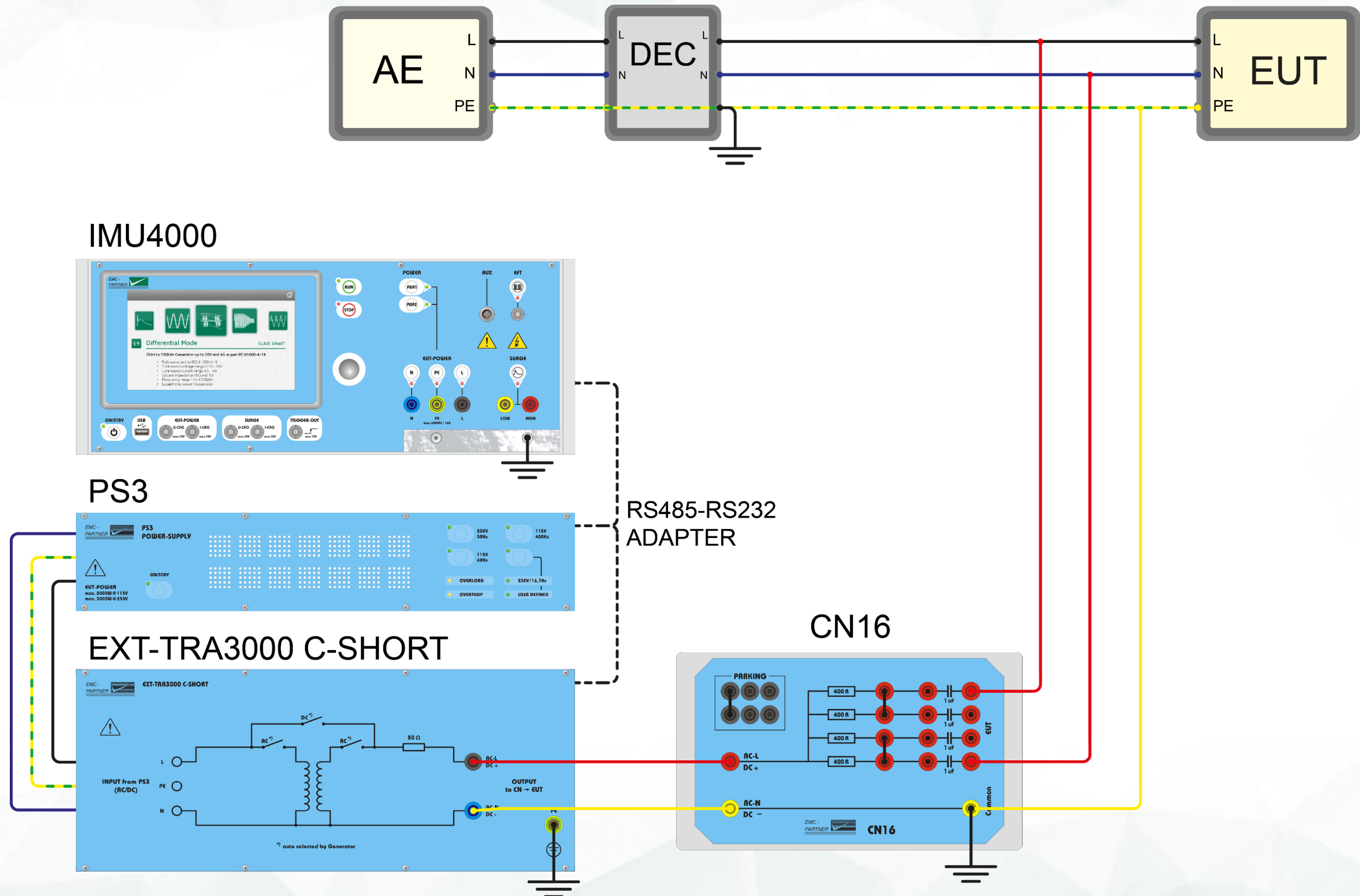


EXT-TRA3000 C-SHORT



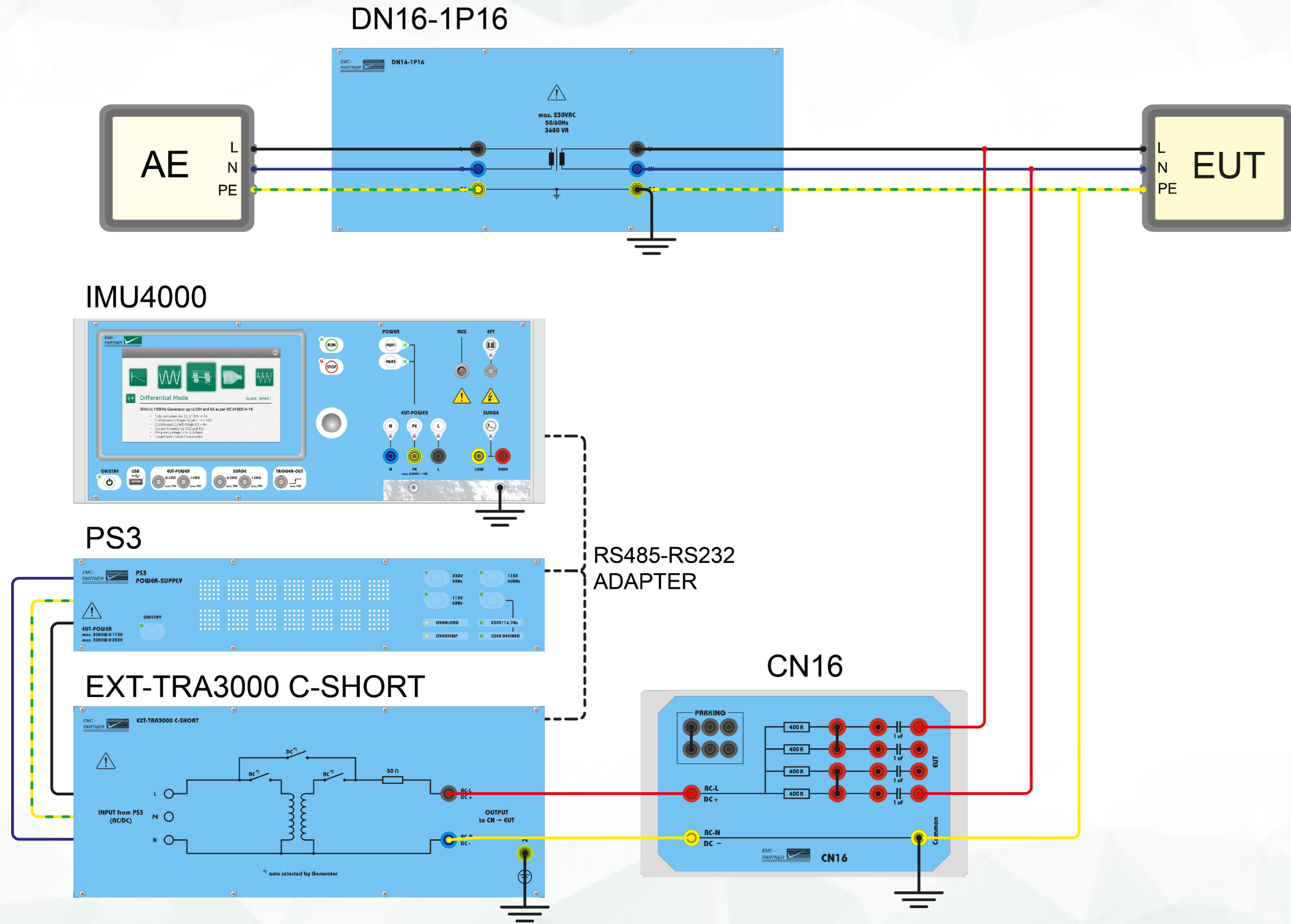
Short circuit current can be measured in order to check output impedance.

1.7.8. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, CN16, test setup up to 300V



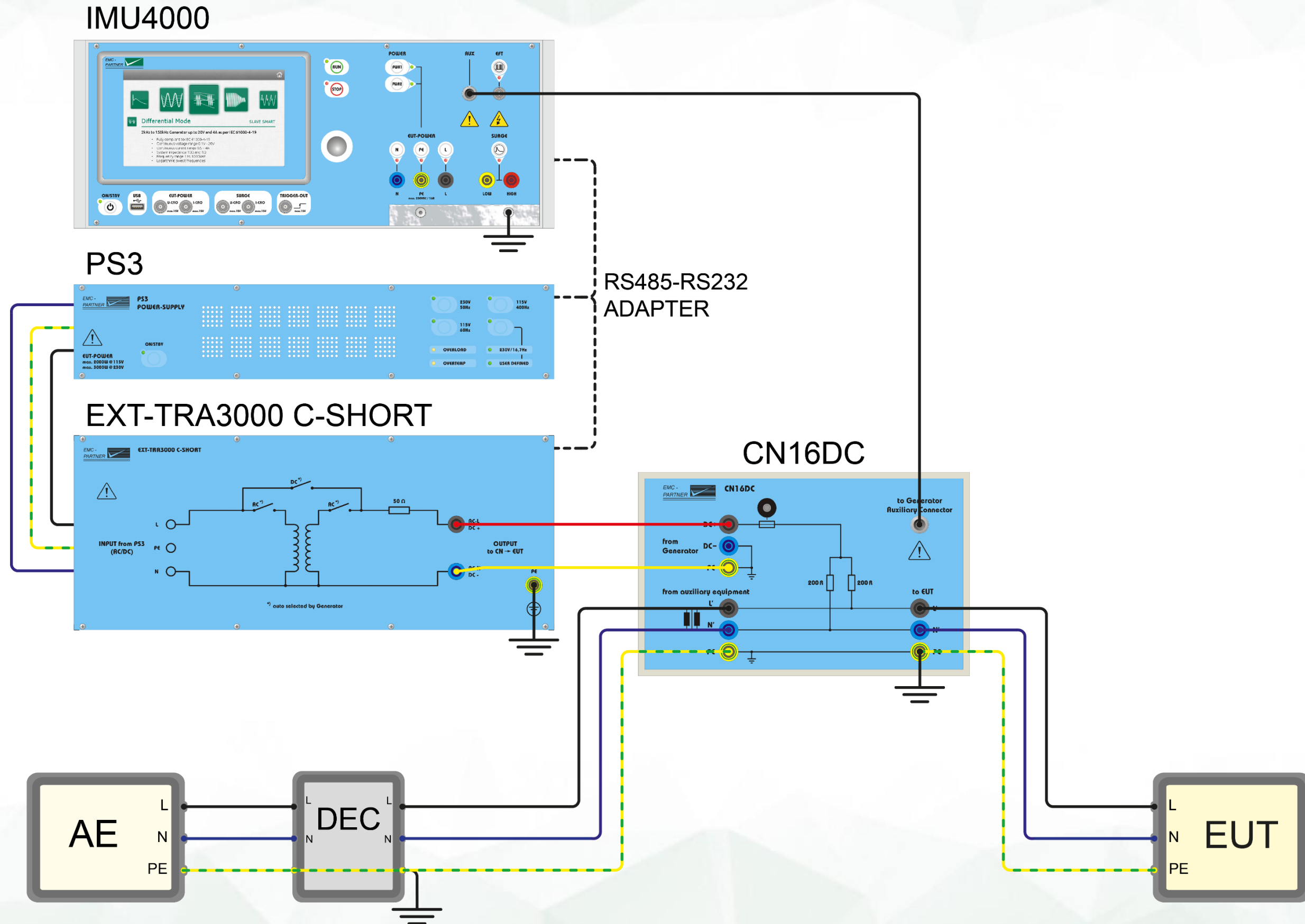
Decoupler could be DN16-1P6, DN16-1P16 or another suitable device calibrated according to standard. Coupling on 4 lines also possible.

1.7.9. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, CN16, DN16-1P16 (or DN16-1P6), test setup up to 300V



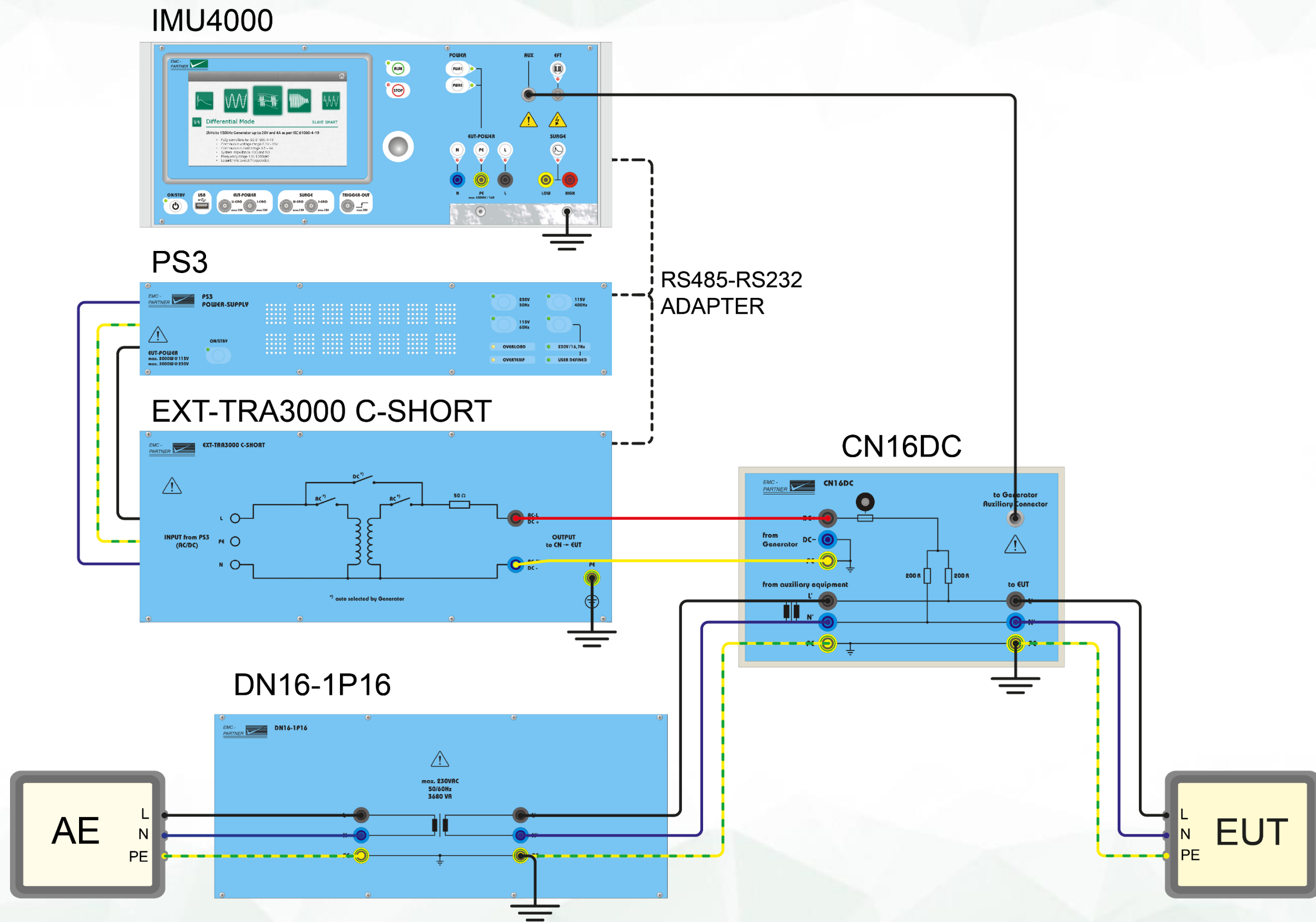
DN16-1P6 and DN16-1P16: common mode decoupling > 60 dB, insulation > 1 kV.

1.7.10. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, CN16DC, test setup up to 300V



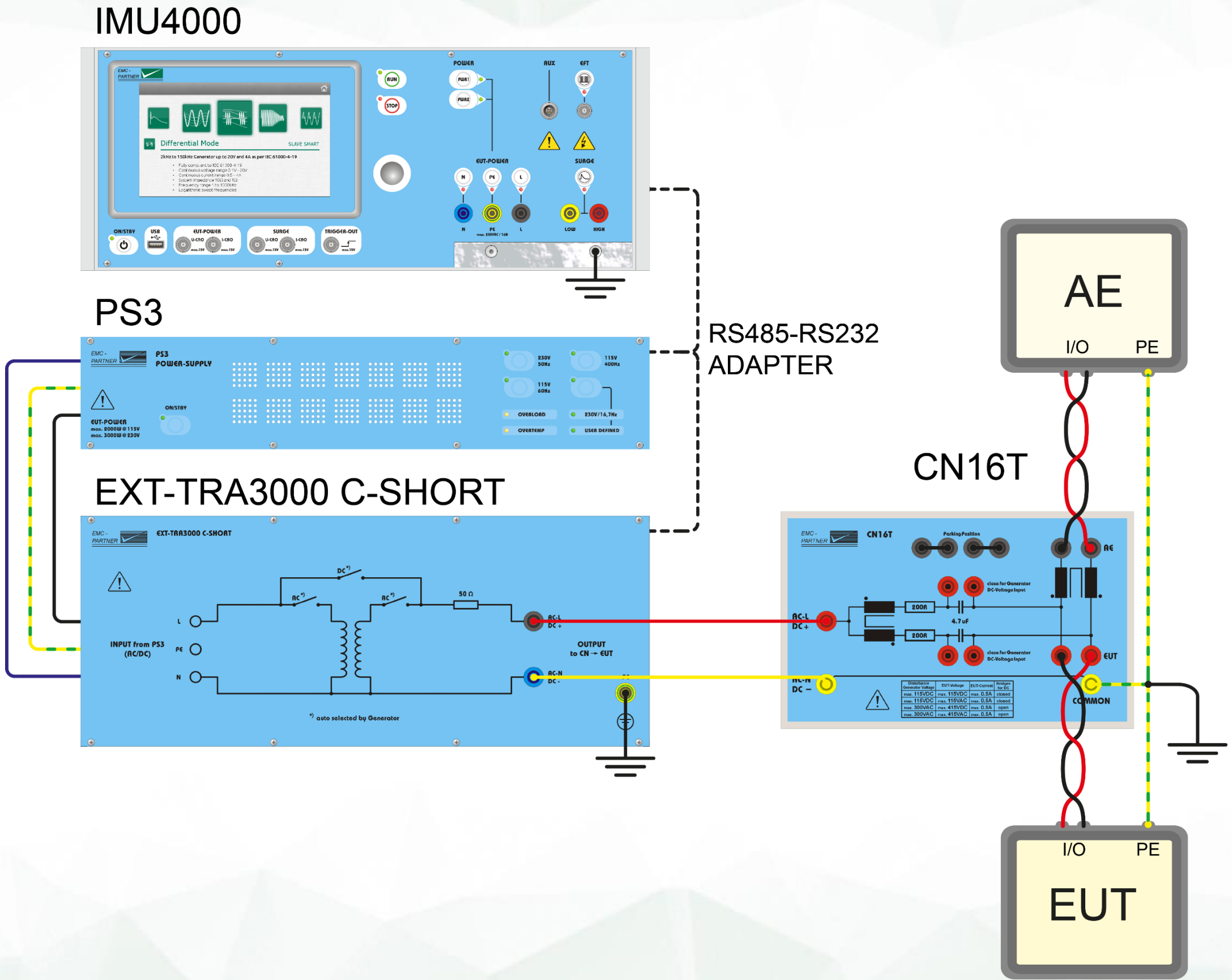
Decoupler could be DN16-1P6, DN16-1P16 or another suitable device calibrated according to standard.

1.7.11. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, CN16DC, DN16-1P16 (or DN16-1P6), test setup up to 300V



DN16-1P6 and DN16-1P16: common mode decoupling > 60 dB, insulation > 1 kV.

1.7.12. Common mode: IMU4000 C, EXT-TRA3000 C-SHORT, PS3, CN16T, test setup up to 300V

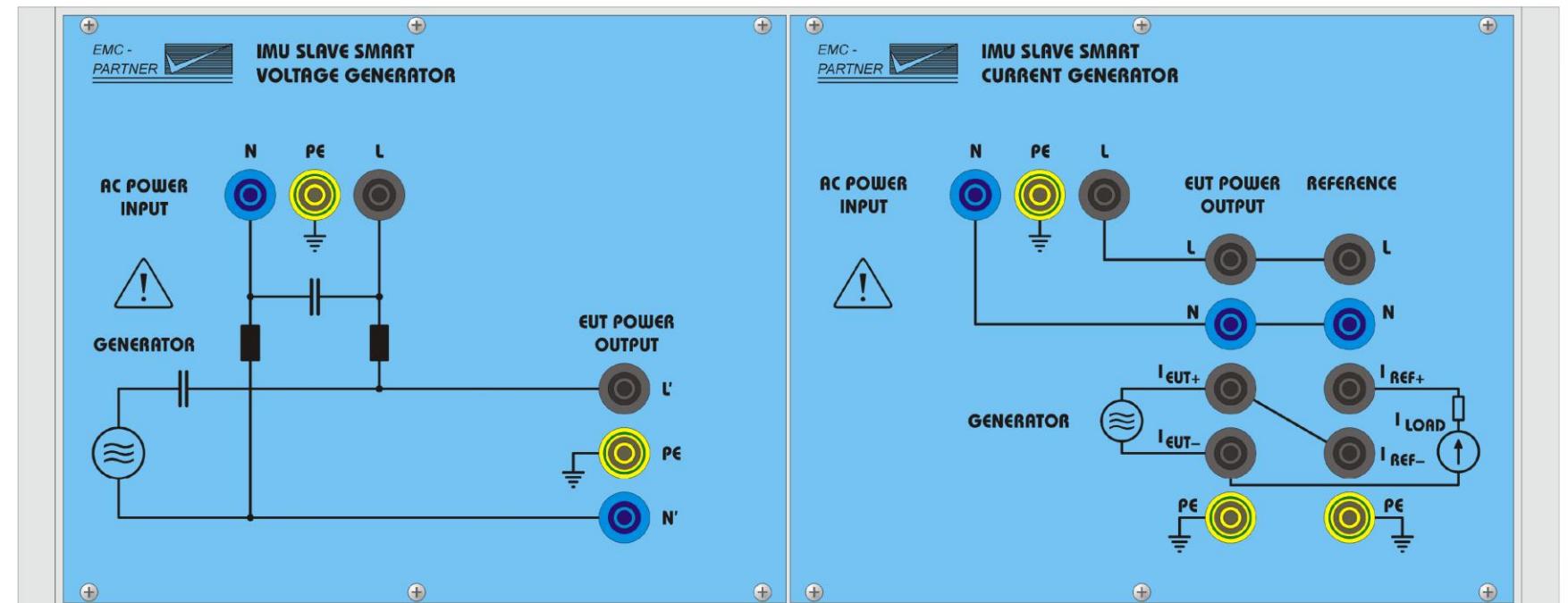
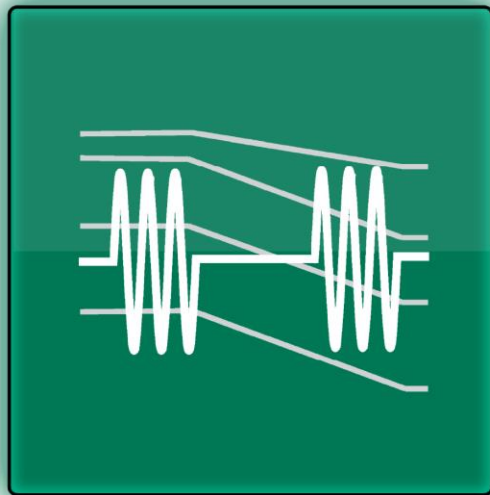


Capacitors have to be bypassed when coupling DC test signal.

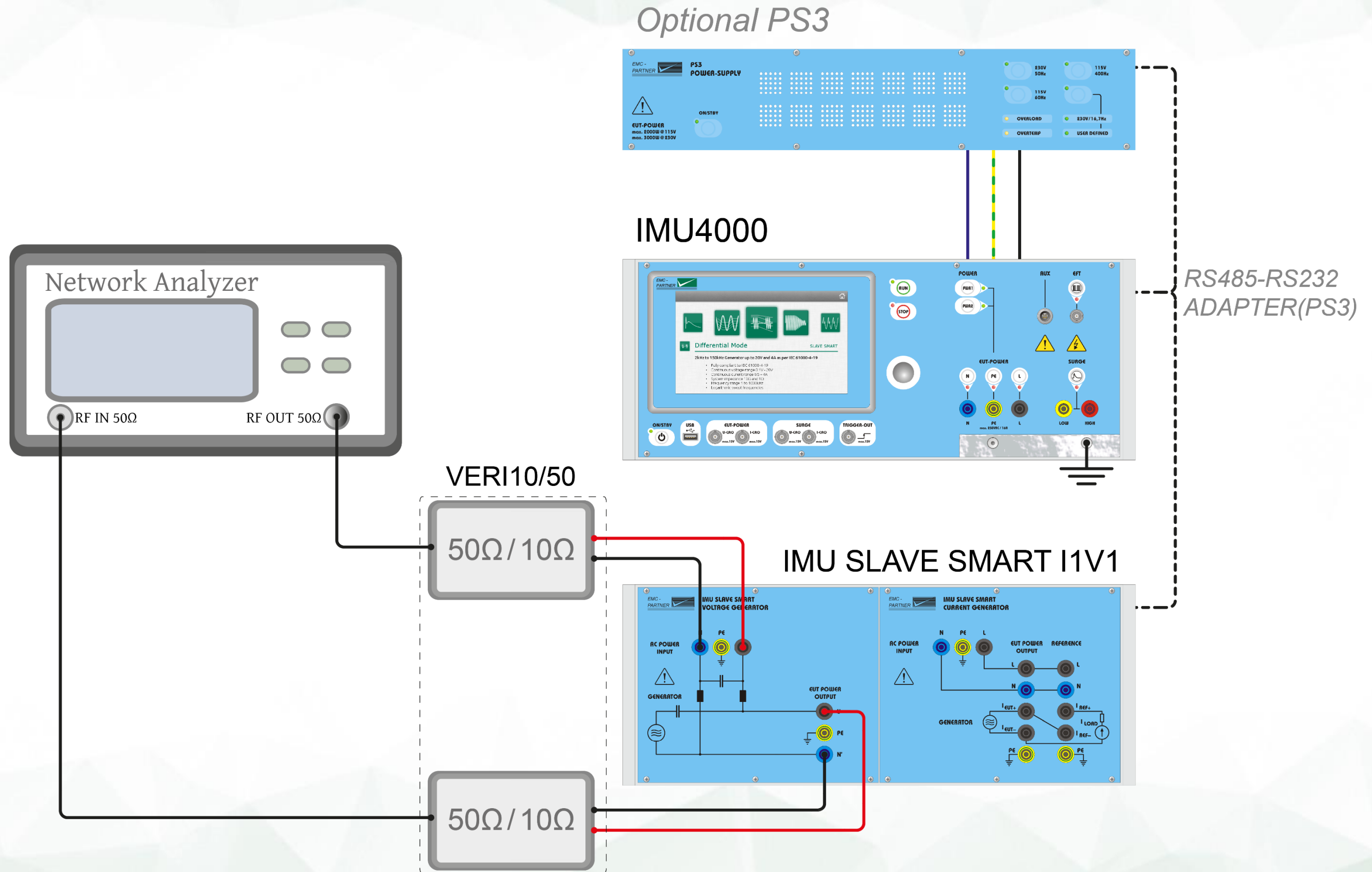
1.8. Differential mode disturbances calibration and test setup as per IEC 61000-4-19 latest edition

IEC 61000-4-19
Edition 1.0 / 2014

Differential mode disturbances 2 kHz - 150 kHz:
full compliant system for both voltage and current tests

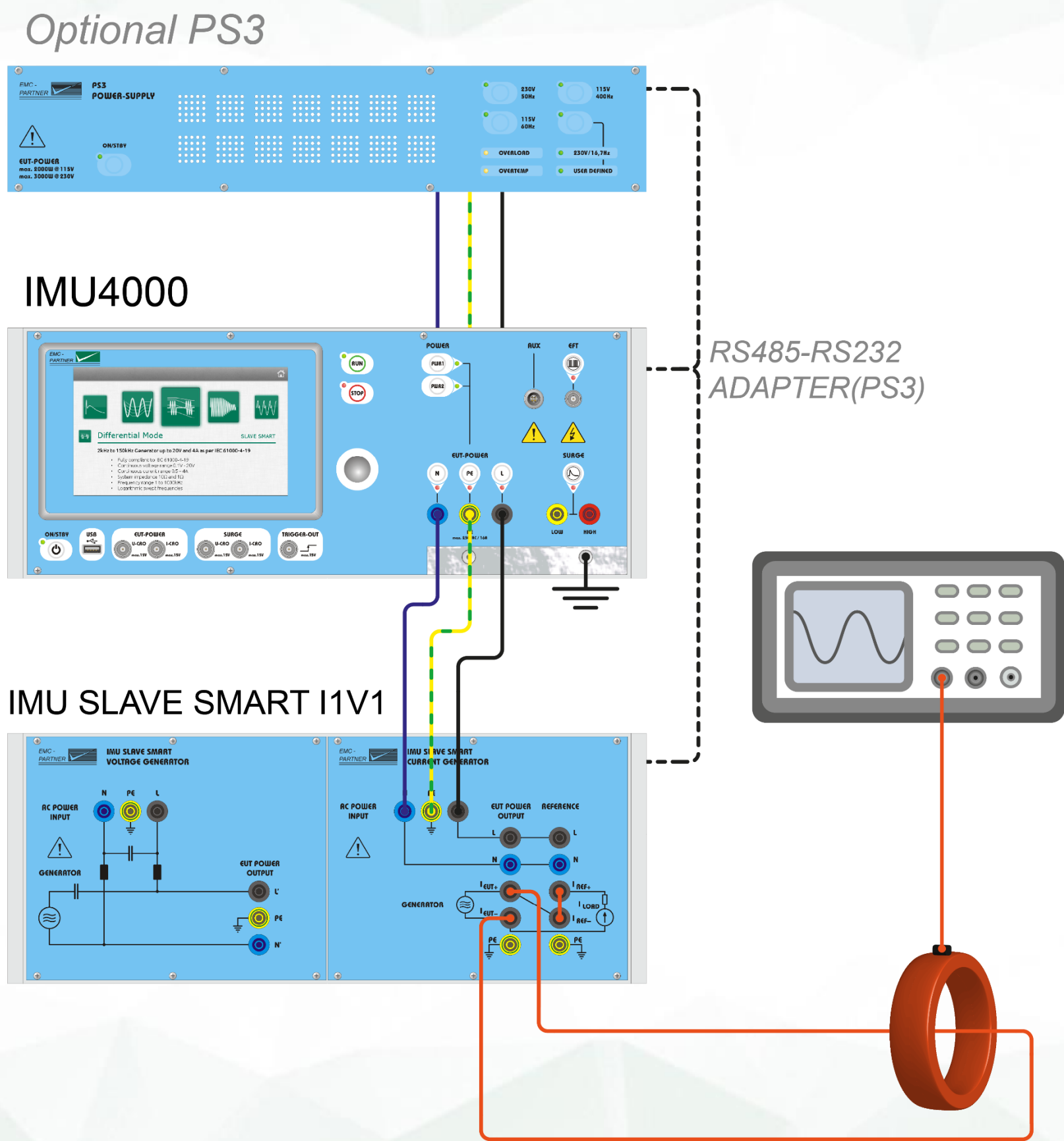


1.8.2. Differential mode: IMU4000 (any model), IMU SLAVE SMART I1V1, (optional PS3), calibration setup for CDN from voltage module



A 10 Ω load as described in the standard is automatically switched on the generator port.

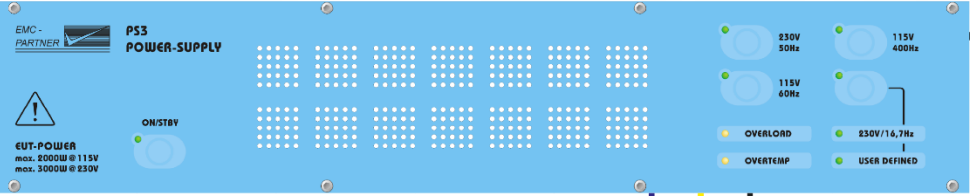
1.8.4. Differential mode: IMU4000 (any model), IMU SLAVE SMART I1V1, (optional PS3), calibration setup for current module



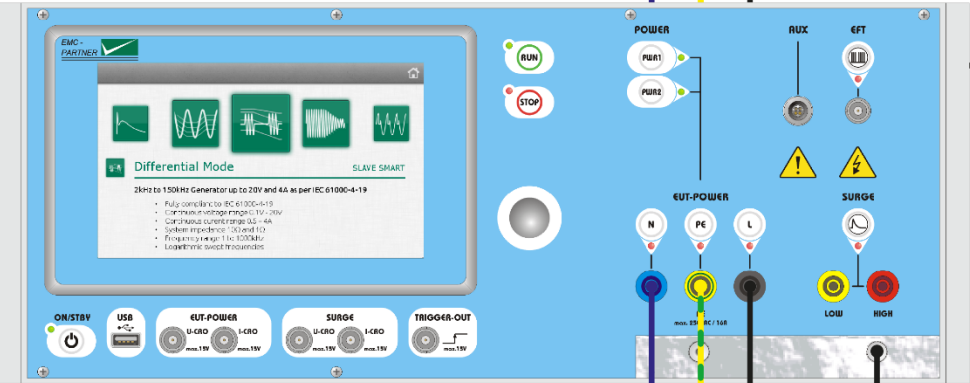
Differential mode current has to be measured up to 150 kHz, all test levels.

1.8.5. Differential mode: IMU4000 (any model), IMU SLAVE SMART I1V1, (optional PS3), current test setup without reference electricity meter

Optional PS3

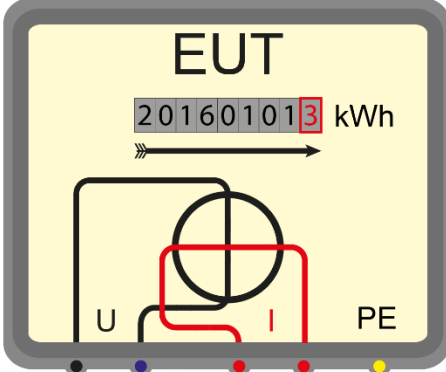
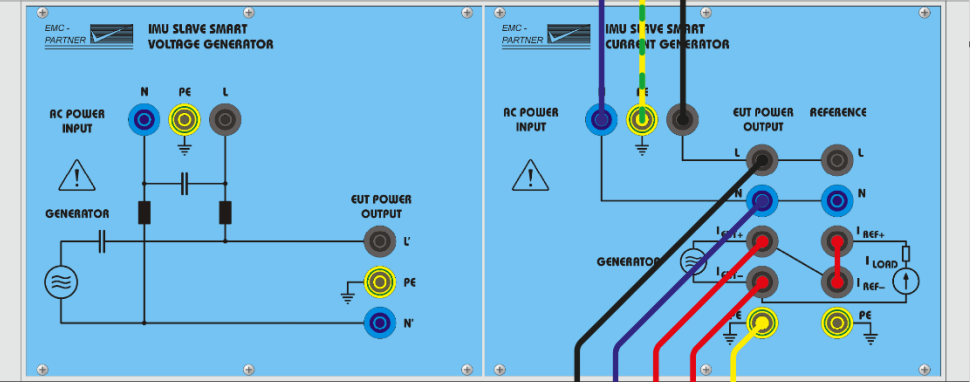


IMU4000



RS485-RS232
ADAPTER(PS3)

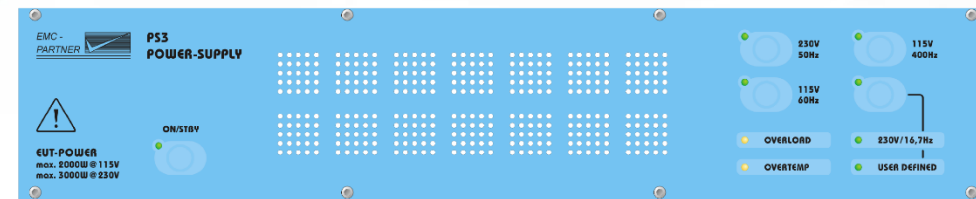
IMU SLAVE SMART I1V1



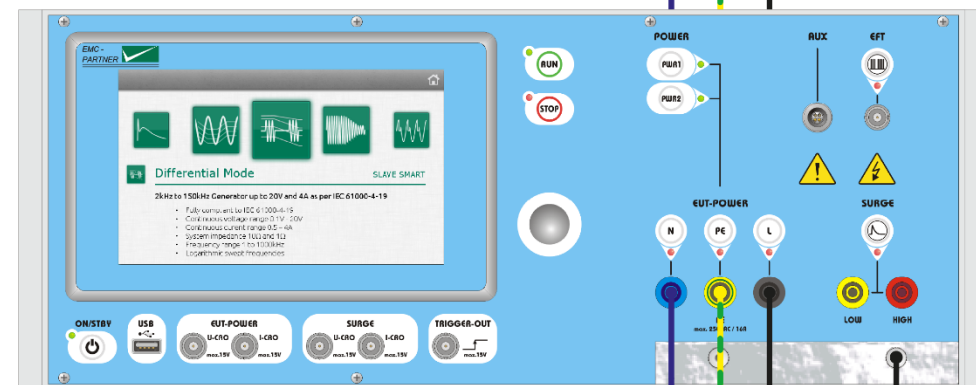
For three phase electricity meters, the test is performed phase by phase.

1.8.6. Differential mode: IMU4000 (any model), IMU SLAVE SMART I1V1, (optional PS3), current test setup with reference electricity meter

Optional PS3

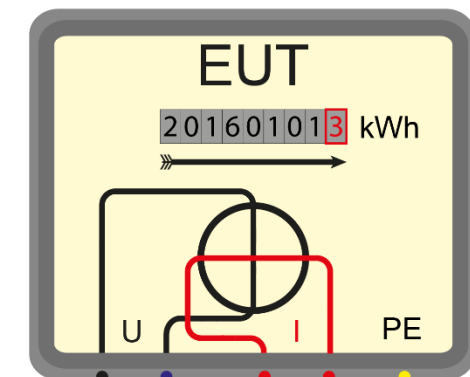
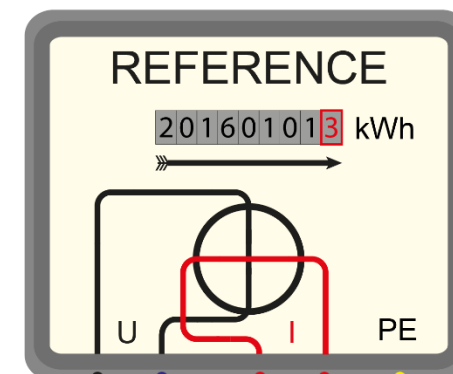
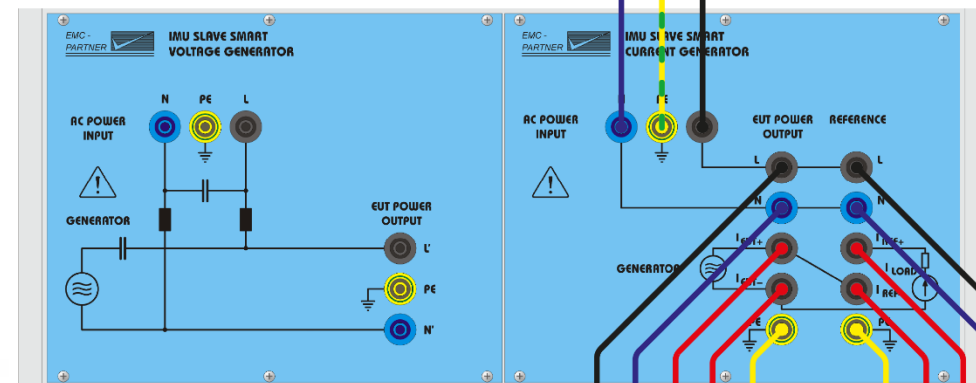


IMU4000



RS485-RS232
ADAPTER(PS3)

IMU SLAVE SMART I1V1

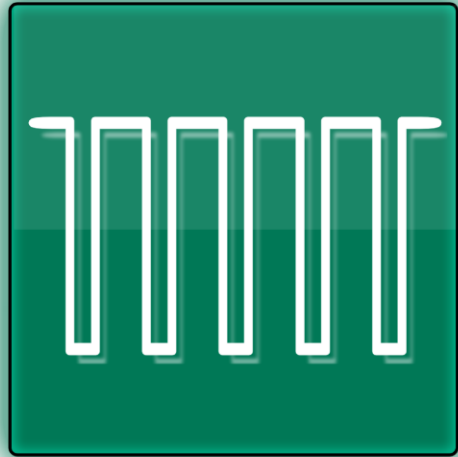


For three phase electricity meters, the test is performed phase by phase.

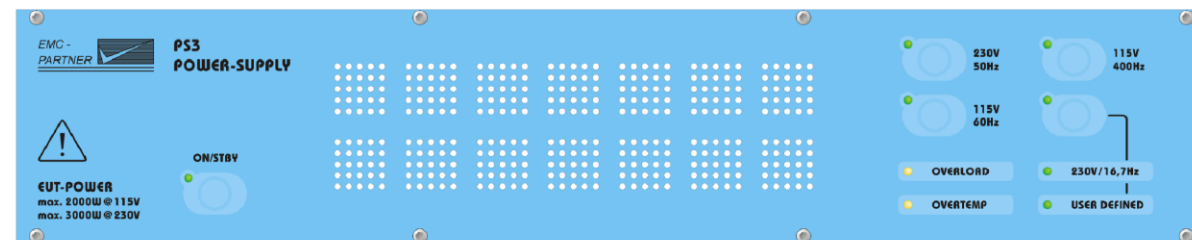
1.9. DC interruptions and dips calibration and test setup as per IEC 61000-4-29 latest edition

IEC 61000-4-29
Edition 1.0 / 2000

DC dips and interruptions: power sources are part of the test system, must be calibrated together with the generator



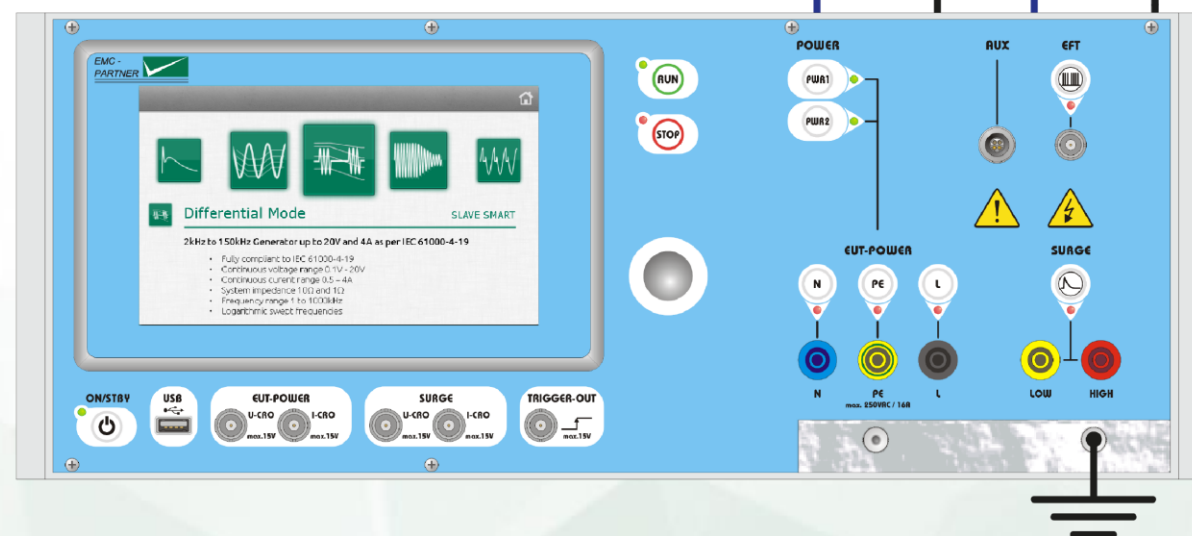
PS3



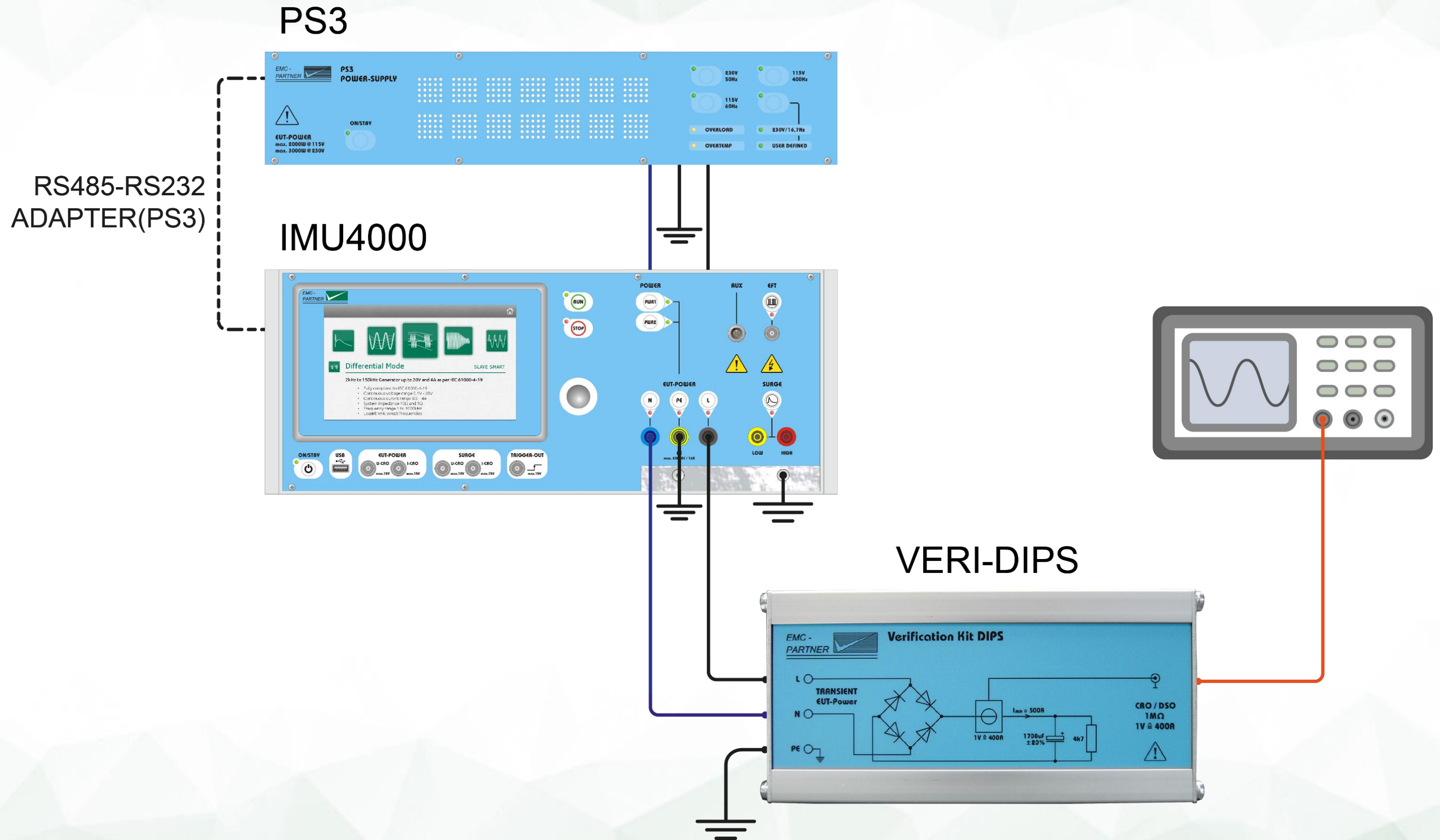
PS3



IMU4000

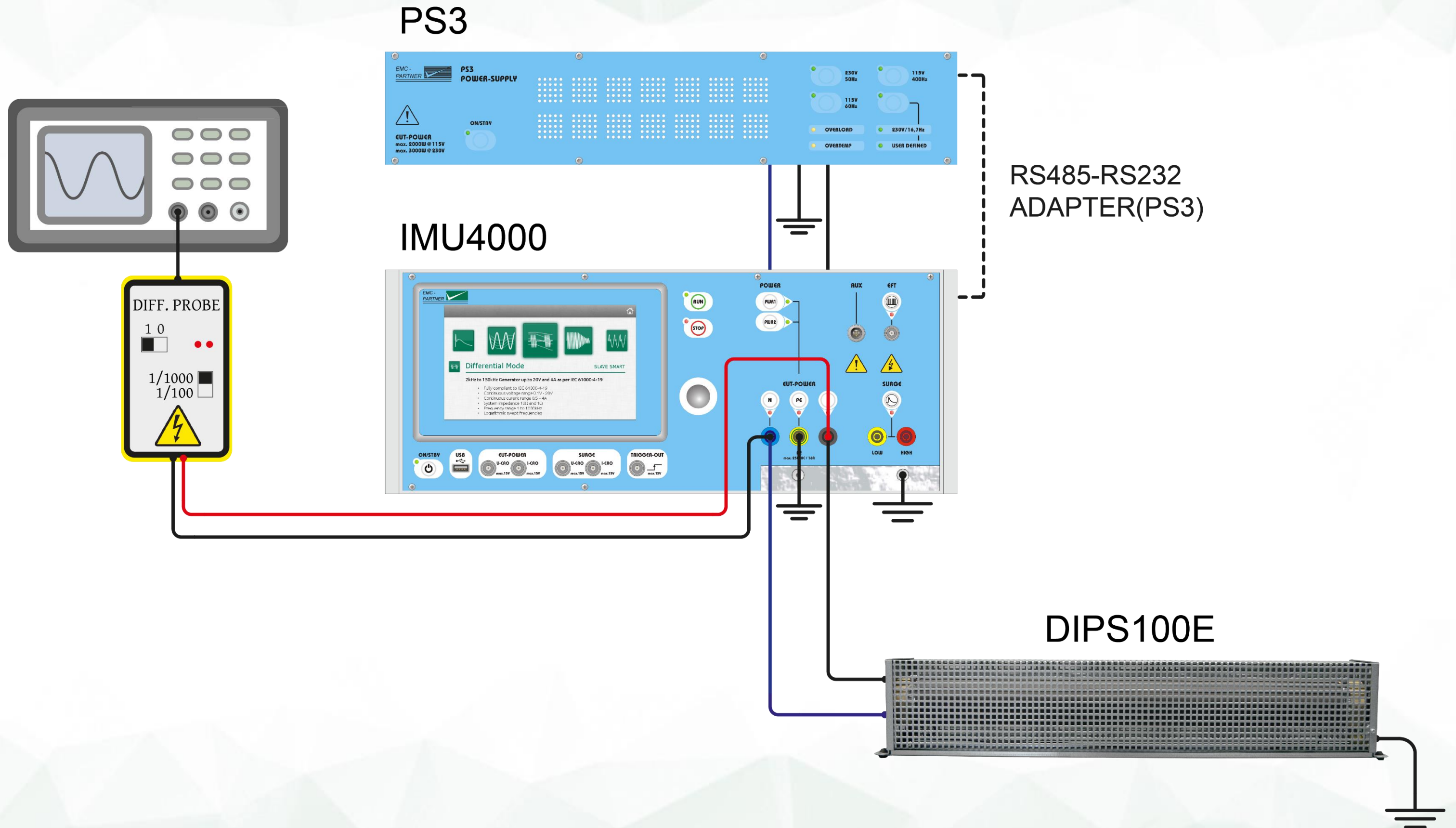


1.9.1. DC interruptions: IMU4000 D (+ EXT-TRA3000 D-29I), 1 x PS3 (+ 1 x RS232 – RS485 adapter), inrush current calibration setup



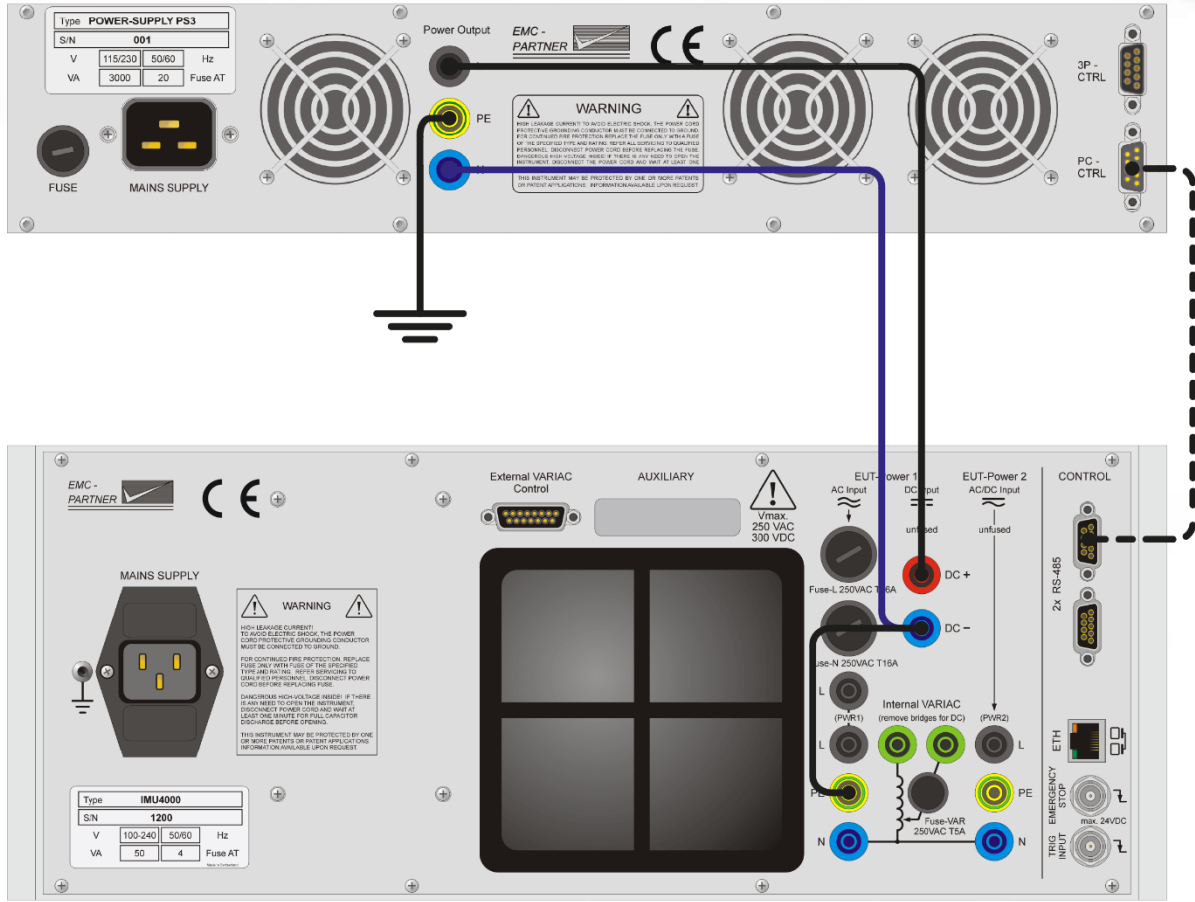
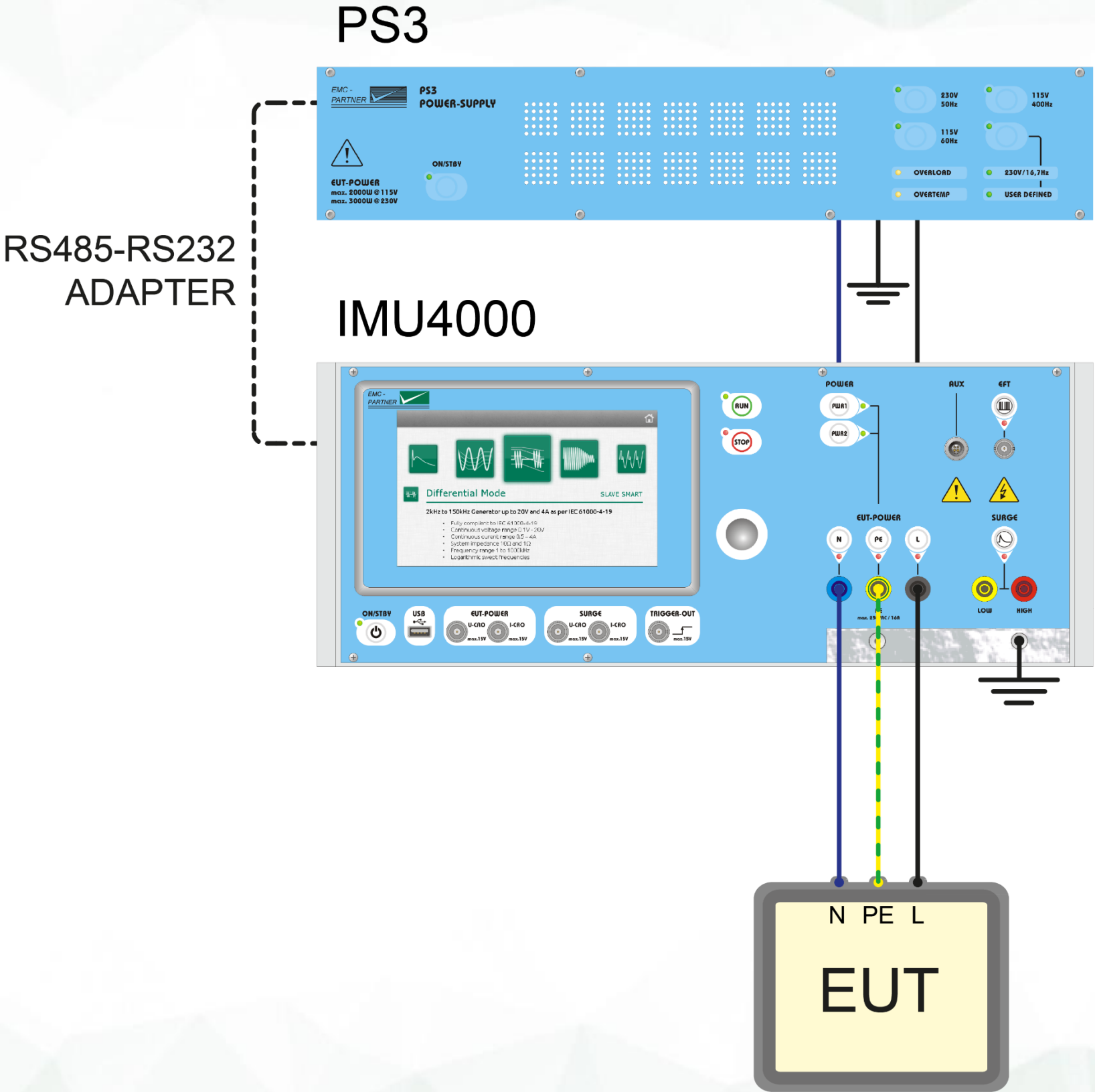
Inrush current has to be measured into a 1700 μ F capacitor.

1.9.2. DC interruptions: IMU4000 D (+ EXT-TRA3000 D-29I), 1 x PS3 (+ 1 x RS232 – RS485 adapter), switch time calibration setup



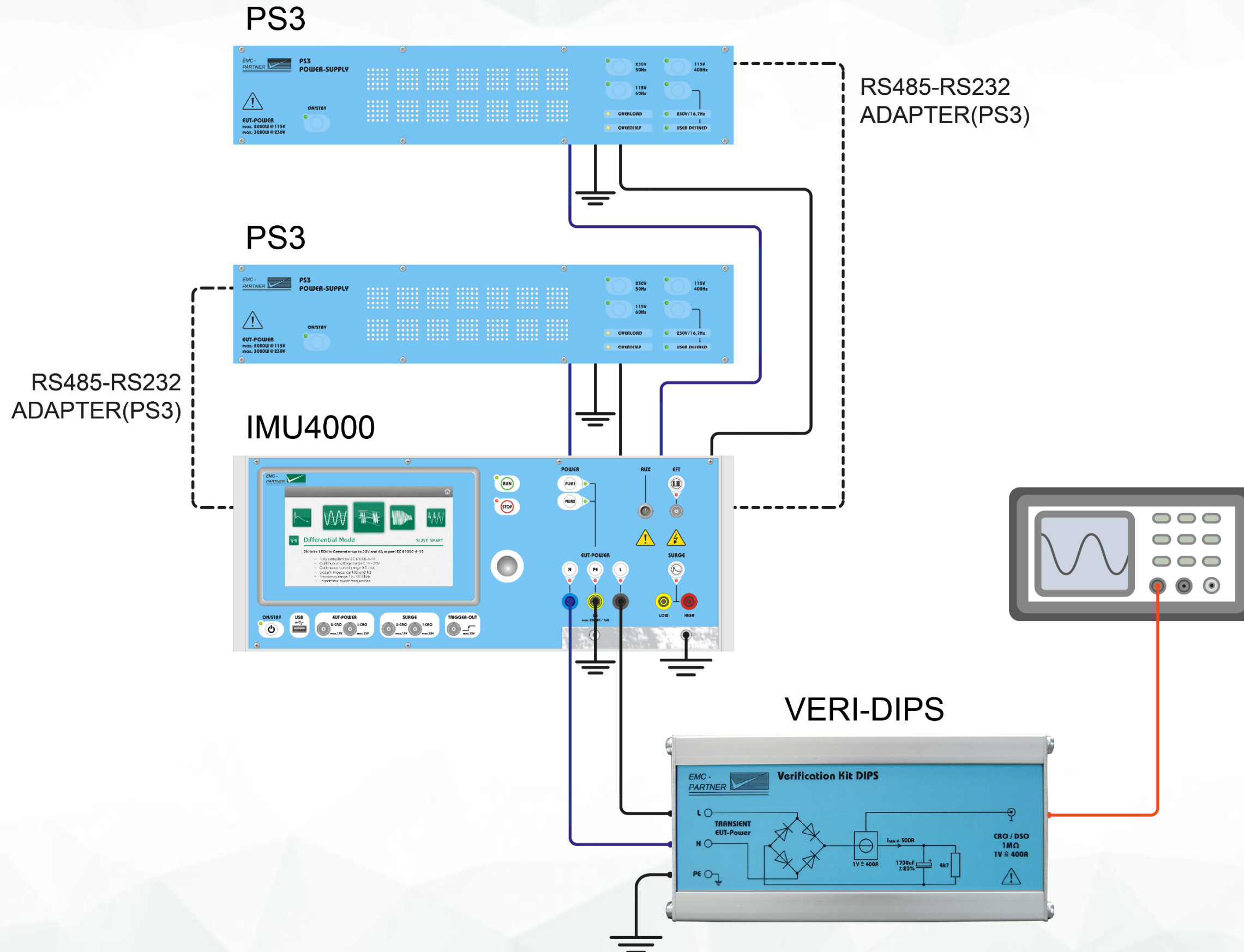
Switching time has to be measured into a 100 Ω load: < 50 μ s.

1.9.3. DC interruptions: IMU4000 D (+ EXT-TRA3000 D-29I), 1 x PS3 (+ 1 x RS232 – RS485 adapter), test setup



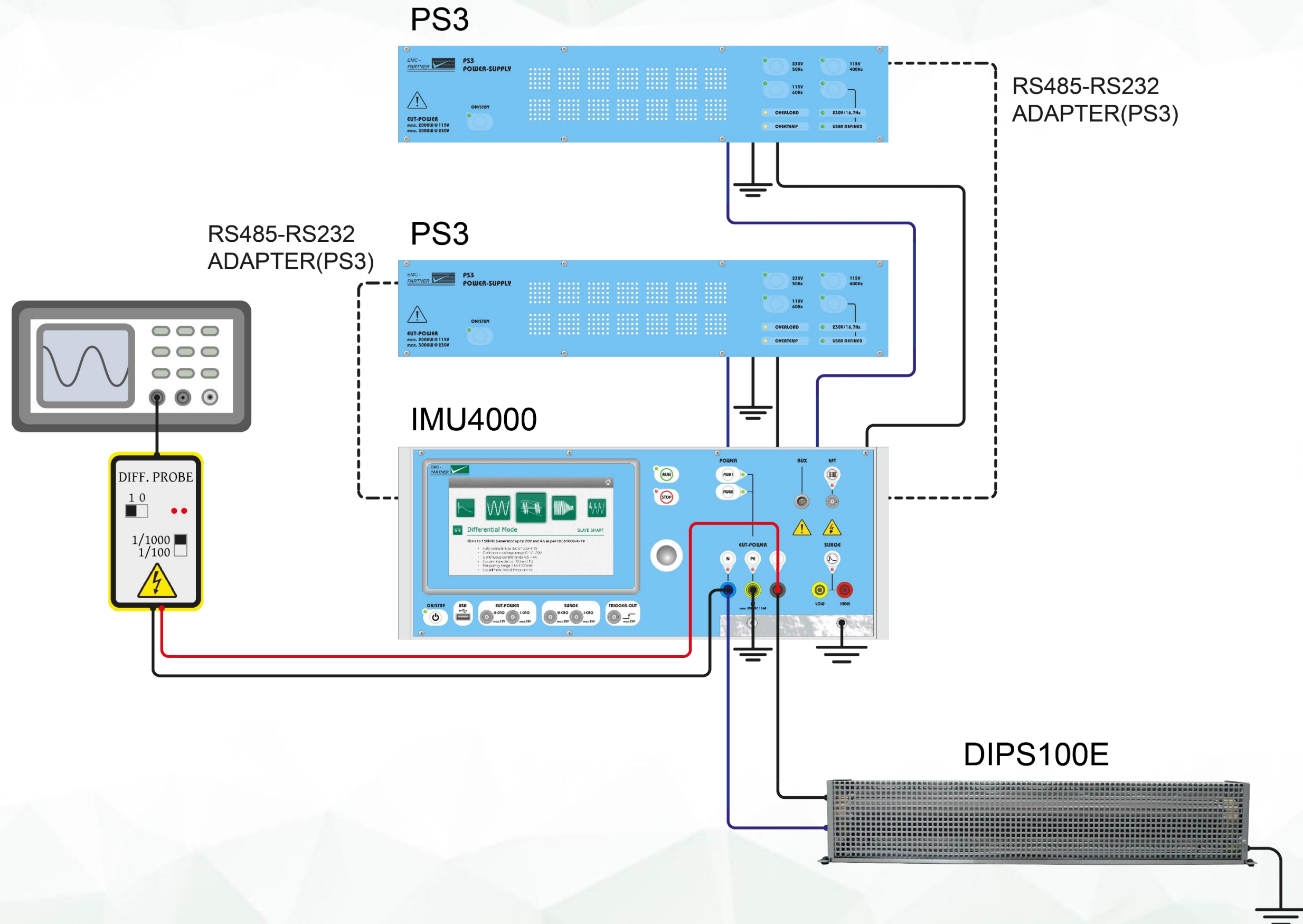
Interruption test requires 1 x PS3 power source (switch to high impedance). Power source is part of the test system, cannot be calibrated separately.

1.9.4. DC dips: IMU4000 D (+ EXT-TRA3000 D-29D), 2 x PS3 (+ 2 x RS232 – RS485 adapter), inrush current calibration setup



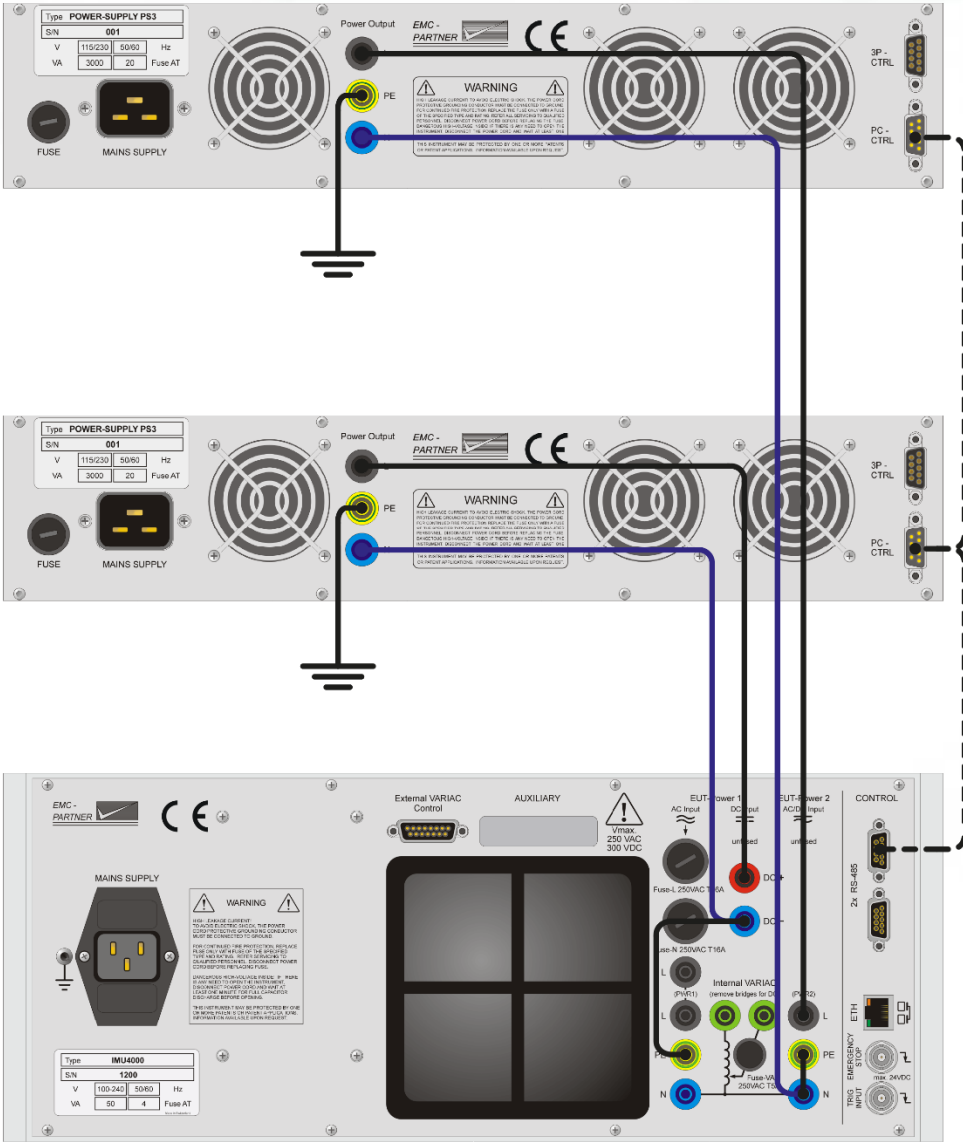
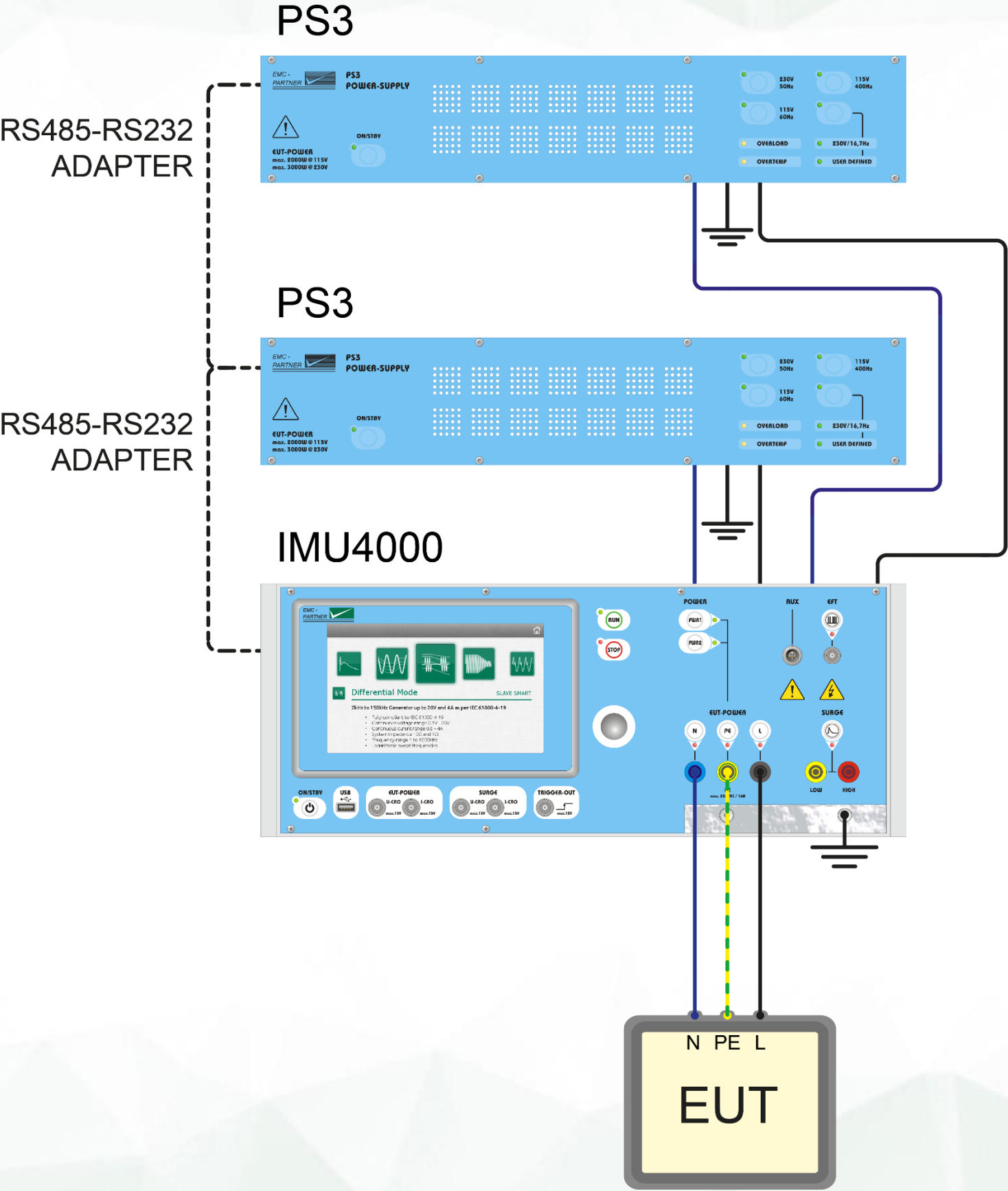
Inrush current has to be measured into a 1700 µF capacitor.

1.9.5. DC dips: IMU4000 D (+ EXT-TRA3000 D-29D), 2 x PS3 (+ 2 x RS232 – RS485 adapter), switch time calibration setup



Switching time has to be measured into a 100 Ω load: < 50 μ s.

1.9.6. DC dips: IMU4000 D (+ EXT-TRA3000 D-29D), 2 x PS3 (+ 2 x RS232 – RS485 adapter), test setup



Dip test requires 2 x PS3 power sources. Power sources are part of the test system, cannot be calibrated separately.



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