PHYSICAL LAB

SCIENCE SHAPING SOUND

PRECISION MEASUREMENT

IMP-BOX

Voltage • Current • Impedance • Power

USER MANUAL

Connections • Range Selection • Operation • Technical Data

REVISION 1.0 | JULY 2026

IMP-BOX PRECISION MEASUREMENT INTERFACE

Read This First

Intended use, safety and measurement principle

The PHYSICAL LAB IMP-Box is a passive laboratory interface for precision measurement of voltage, current, impedance and power dissipation in loudspeakers and passive crossover networks. It is inserted between a conventional ground-referenced power amplifier and the device under test (DUT), allowing measurements under realistic constant-voltage drive conditions.

! **DANGER – BRIDGED AMPLIFIERS** Do not use the IMP-Box with a bridged or floating-output power amplifier. The PHYSICAL LAB Reference Mono Amplifier has a bridged output and must not be connected to the IMP-Box. Use a ground-referenced amplifier output only.

Essential safety rules

- Start every test at a low generator level and increase the signal only after verifying all connections.
- Do not exceed 100 V load voltage or 25 A load current.
- Select a current range that safely covers the expected peak current.
- Never exceed the maximum input level of the connected analyzer or measurement instrument.
- Use balanced or floating analyzer inputs where possible and verify grounding before connecting equipment.
- Switch the power amplifier off before changing amplifier, DUT or IMP-Box connections.
- Use cables, connectors and loads rated for the expected voltage, current and power.

Measurement principle

The IMP-Box measures the voltage across the DUT and the current flowing through it. Complex impedance is calculated from Z = U / I, while complex power and power dissipation can be derived from the same voltage and current data. Because the DUT is driven from a low-impedance voltage source, measurements represent normal loudspeaker operating conditions more accurately than very-low-level constant-current methods.

IMP-BOX PRECISION MEASUREMENT INTERFACE

Contents and Quick Start

Document structure and basic connection sequence

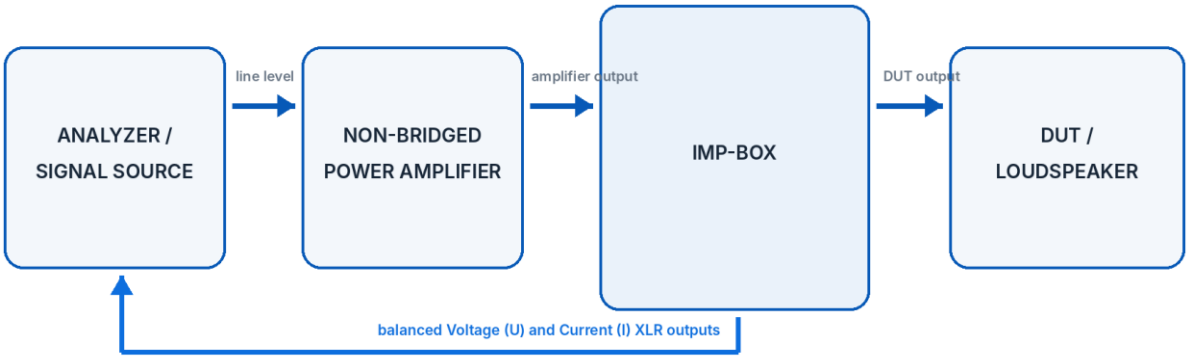
Quick-start sequence

- Switch the power amplifier off and set the analyzer generator to minimum level.
- Connect amplifier RED to the IMP-Box RED amplifier input.
- Connect amplifier BLACK to the selected IMP-Box BLACK input: 0 dB, -20 dB or -40 dB.
- Connect the DUT to the red and black DUT output terminals.
- Match the rear current-output range to the selected front input range.
- For straightforward processing, set the rear voltage output to the same range as the current output.
- Connect the balanced Voltage (U) and Current (I) XLR outputs to the analyzer inputs.
- Power the amplifier, verify the setup and increase the test level slowly.

! **Recommended default** Use identical range settings at the front input, rear current output and rear voltage output. The scaling then cancels in the U/I calculation and a 1 Ω sense-resistor value can be used in supported analyzer software.

System Connection and Signal Flow

Typical constant-voltage measurement arrangement



Connection order

1. Analyzer to amplifier Connect the analyzer or signal generator to the input of a conventional non-bridged power amplifier.	**2. Amplifier to IMP-Box** Connect the amplifier output to the red input and to the black input corresponding to the selected current range.
3. IMP-Box to DUT Connect the DUT only to the dedicated red and black DUT output terminals.	**4. IMP-Box to analyzer** Connect the rear balanced Voltage (U) and Current (I) XLR outputs to separate analyzer inputs.

Grounding requirements

The amplifier black terminal must be a normal ground-referenced return. A bridged or floating amplifier can place significant voltage on both output terminals and may short through the IMP-Box, analyzer or connected computer. Confirm the amplifier topology before use.

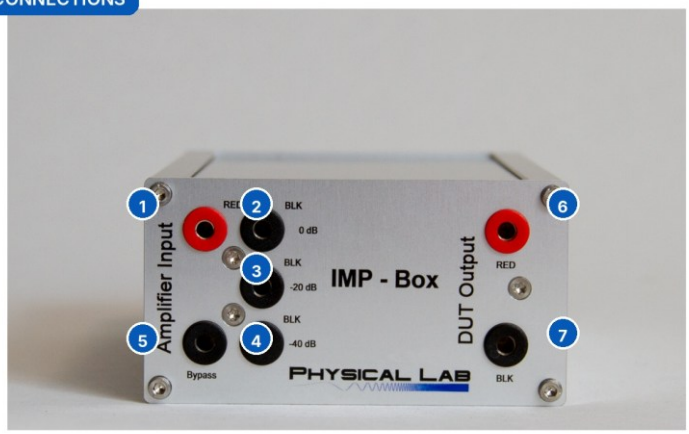
! **Analyzer input protection** At high drive levels, select suitable rear output attenuation and confirm the analyzer input rating before starting the sweep.

IMP-BOX PRECISION MEASUREMENT INTERFACE

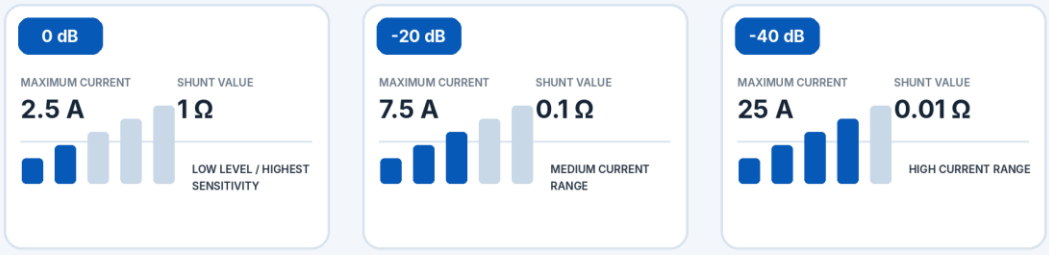
Front Panel and Input Ranges

Amplifier input, DUT output and current-range selection

AMPLIFIER / DUT CONNECTIONS



No.	Connection	Function
1	Amplifier input – RED	Connect to the positive/red amplifier output terminal.
2	0 dB BLACK input	2.5 A maximum current; 1 Ω shunt; highest sensitivity.
3	-20 dB BLACK input	7.5 A maximum current; 0.1 Ω shunt.
4	-40 dB BLACK input	25 A maximum current; 0.01 Ω shunt.
5	Bypass BLACK	Direct return path for special setups; no current-sense range selected.
6	DUT output – RED	Connect to the positive terminal of the loudspeaker or passive network.
7	DUT output – BLACK	Connect to the negative terminal of the DUT.



! **Range selection rule** Use the lowest-current range that safely covers the expected peak current. This maximizes measurement sensitivity while protecting the shunt network.

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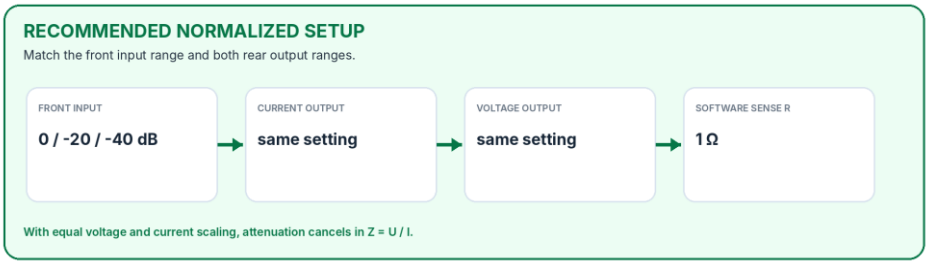
Rear Panel and Output Scaling

Balanced voltage/current outputs and attenuation selection

No.	Connection	Function
1	Voltage (U) XLR output	Balanced signal proportional to voltage across the DUT.
2	Current (I) XLR output	Balanced signal proportional to current through the DUT.
3	Voltage-output range	Select 0 dB, -20 dB or -40 dB with the supplied range link.
4	Current-output range	Select 0 dB, -20 dB or -40 dB; normally match the front input range.



Alternative scaling

Example configuration	Sense-R value for processing
Front -20 dB / Current -20 dB / Voltage 0 dB	0.1 Ω
Front -40 dB / Current -40 dB / Voltage 0 dB	0.01 Ω

! **Important** Only the balanced XLR measurement outputs are attenuated. The DUT output is not reduced by the rear range settings.

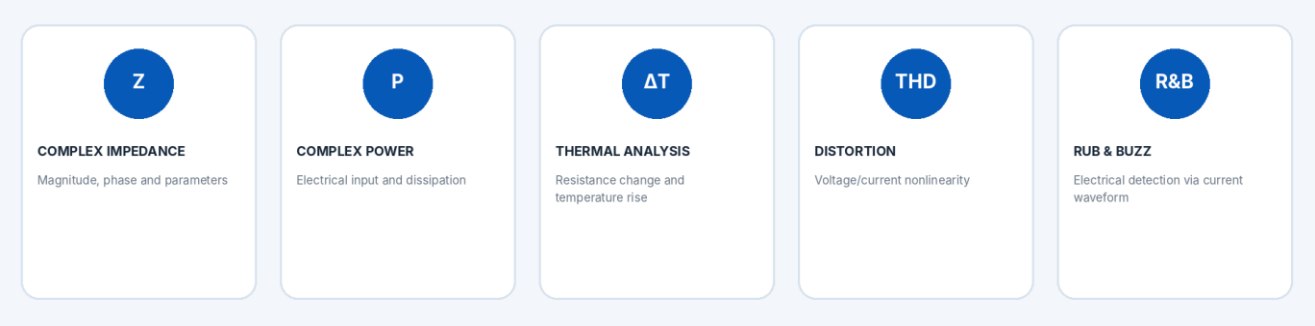
Measurement Procedure and Applications

Practical operation and available measurement results

Recommended measurement procedure

- Select the expected frequency range, sweep duration and generator level in the analyzer.
- For subwoofers and low-frequency resonances, use a sufficiently long sweep and high frequency resolution.
- Verify that the selected IMP-Box current range and analyzer attenuation cannot be exceeded.
- Run the measurement at low level first and inspect voltage and current waveforms.
- Increase the level gradually while monitoring current, DUT temperature and amplifier behavior.
- Calculate impedance from the complex voltage and current data: Z = U / I.
- Store the original U and I curves together with the calculated result for traceability.

! **High-power tests** Voice-coil heating and nonlinear acoustic or magnetic behavior can change the measured impedance. Record the power level, sweep duration and DUT condition with every result.



Typical applications

The same voltage/current acquisition supports complex impedance and power measurements, high-level driver parameter analysis, temperature-rise estimation from resistance change, loaded crossover transfer functions, current and voltage distortion, and electrical detection of low-frequency rub-and-buzz or cone-noise artifacts.

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Technical Data, Maintenance and Contact

Specifications and document control

Electrical specification	Value
Maximum load voltage	100 V
Maximum load current	25 A
Current ranges	0 dB / -20 dB / -40 dB
Shunt resistor values	1 Ω / 0.1 Ω / 0.01 Ω, 1%
Maximum current at 0 dB	2.5 A
Maximum current at -20 dB	7.5 A
Maximum current at -40 dB	25 A
XLR output impedance	100 Ω
Operating principle	Constant-voltage drive; voltage and current sensing
Mechanical / connection data	**Value**
Dimensions, W × L × H	104 × 177 × 56 mm
Weight	500 g
Amplifier / DUT connectors	4 mm laboratory binding posts
Measurement outputs	2 × balanced 3-pin XLR male
Power requirement	Passive device; no mains supply

Cleaning and maintenance

- Disconnect the power amplifier, DUT and analyzer before cleaning or inspection.
- Use a soft, dry cloth. Do not use liquids, solvents or abrasive materials.
- Inspect binding posts, range links and XLR connectors periodically for damage or contamination.
- Do not open or modify the unit unless service is carried out by qualified personnel.

Service and contact

PHYSICAL LAB
Teutonenstrasse 4A
89250 Senden, Germany
Tel. +49 (0)7307 800627
www.physical-lab.com

Revision history

Revision	Date	Description
1.0	July 2026	Complete visual redesign using current PHYSICAL LAB branding and rebuilt product graphics.