5µH Line Impedance Stabilisation Network

1 Introduction

The TBL0550-1B is an affordable 5µH LISN designed for conducted emission measurements / line termination in the frequency range of 100 kHz to 400 MHz. It complies with CISPR-25 (EN 55025), numerous automotive manufacturer standards, MIL-STD-461F, DO-160, AECTP-500 and ISO 7637-2.

LISNs are inserted into the supply lines of the EUT (Equipment Under Test). Conducted noise which is present at the supply terminals of the EUT can be measured at the BNC connectors using a spectrum analyzer or a measurement receiver. The source (supply) terminal and the EUT terminal are decoupled by a 5µH inductor.

Two TBL0550-1B in combination with the Tekbox LISN Mate enable separate measurement of common mode and differential mode noise.

5µH Line Impedance Stabilisation Network

2 Specification

Topology: single path, configurable, 50Ω // 5µH + 1Ω, 50Ω // 5µH; the internal capacitor can be disconnected for ISO 7637-2 and DO-160 set ups; an external 10µF capacitor is required for DO-160; the LISN is factory setup to 50Ω // 5µH + 1Ω, other configurations require setting of an internal high current jumper.

Supported standards: CISPR 16-1-2, CISPR 25, MIL-STD-461G, DO-160, ISO11452-4 and ISO 7637-2

Characterized frequency range: 10 kHz – 400 MHz

DC Resistance: < 5 mΩ Source+ to EUT+; < 5 mΩ Source- to EUT-

Maximum current: 50A continuous; see plot with heat up characteristics, chapter 1.8

Maximum operating voltage range: 0 – 250V AC @50/60 Hz, 130V AC @ 400Hz, 250V DC

Absolute maximum rating of internal components: 450V DC

RF connector: N-Female

EUT connector: binding post, M6, 4mm center hole, 63A, 1kV, Schützinger POL 631 L

SOURCE connector: binding post, M6, 4mm center hole, 63A, 1kV, Schützinger POL 631 L

EARTH: 6 mm Earth stud with wing-nut, exposed stainless steel bottom panel with mounting slots and countersunk hole for 4mm screw

Jumper: Harwin D3087-98

Dimensions: 125 mm x 125 mm x 275 mm **Weight:** 1.75 kg

3 Warning

Spectrum Analyzer / Measurement Receiver protection:

The TBL0550-1B LISN does not contain any protective elements in the RF path. Use an external attenuator and/or limiter to protect the spectrum analyzer / measurement receiver input from harmful transients or high RF noise levels.

Safety:

Because of the CISPR 16-1-2, CISPR 25 (EN 55025), MIL-STD-461G and DO-160 design requirements, LISNs do not comply with the maximum permissible leakage current as specified in EN61010-1. Furthermore, LISNs do not fulfil the isolation requirements of CAT II.

The LISN housing is connected to the negative / ground SOURCE and EUT pin of the terminal block and the ground of the RF connector. Inadvertently connecting the positive voltage or line voltage to the ground pin puts you at risk of a lethal electric shock. The TBL0550-1B is exclusively for use in laboratories and must be operated by qualified personnel.

5µH Line Impedance Stabilisation Network

4 Principle schematic

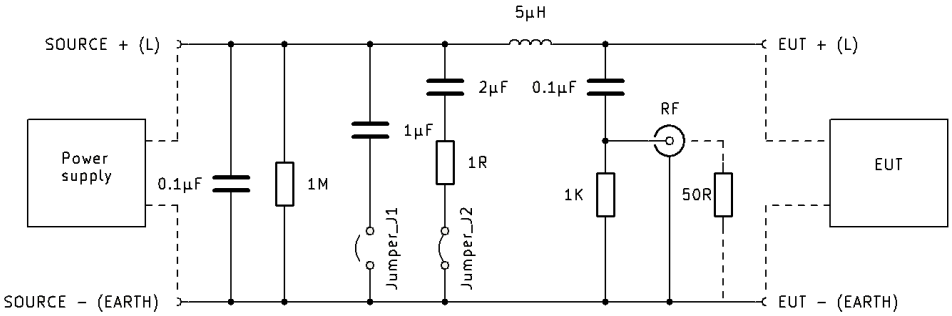


Figure 1: principle schematic

Standards	Jumper J1	Jumper J2
CISPR 16-1-2; CISPR 25: 50Ω // 5µH + 1Ω	open	shorted
CISPR 25, MIL-STD-461G, ISO 11452-4: 50Ω // 5µH	shorted	open
CISPR 25 High Voltage Artificial Network (HV-AN)	open	open
DO-160; 10µF capacitor attached to source terminals	open	open
ISO 7637-2	open	open

To access the jumpers, the housing cover must be removed. Re-attach it after setting the jumpers. Refer to the table above, or to the table on the silkscreen print of the PCB. There are an unconnected parking positions for the jumpers, position (J3) + (J4).

5µH Line Impedance Stabilisation Network

5 Impedance

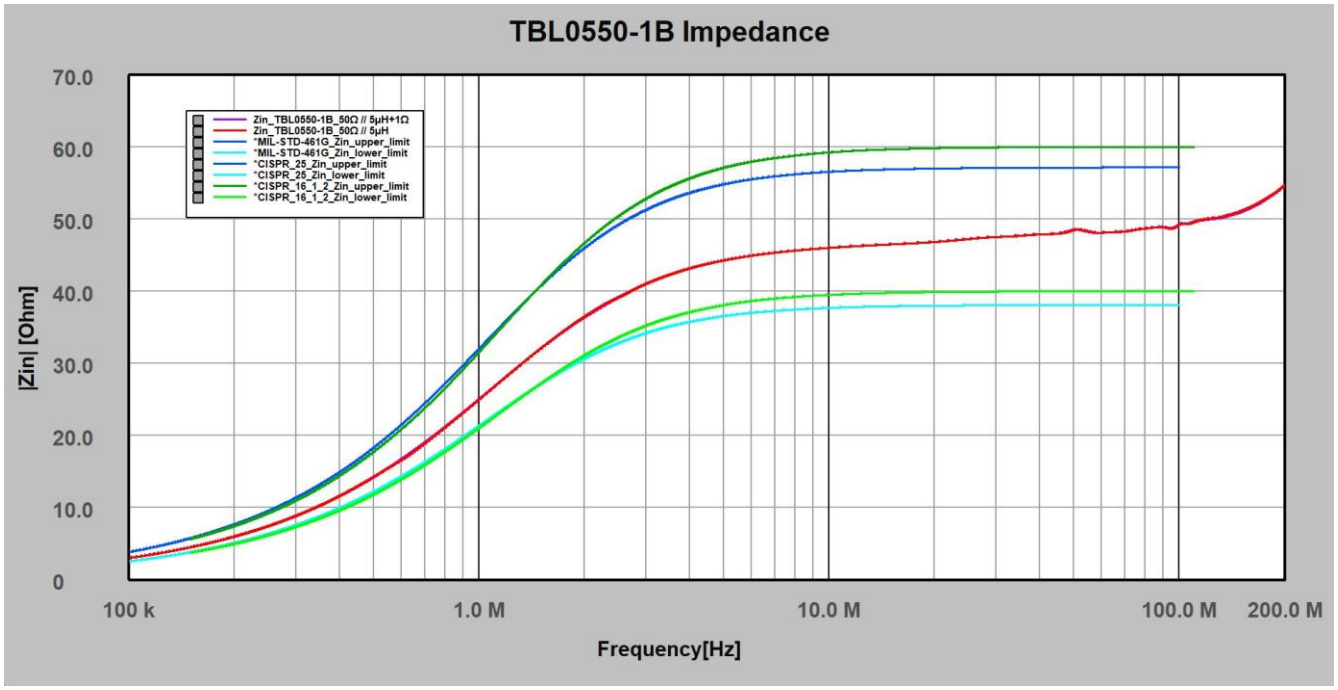


Figure 2: TBL0550-1B impedance ,100 kHz – 110 MHz, 50Ω // 5µH+1Ω, 50Ω // 5µH, source terminals shorted

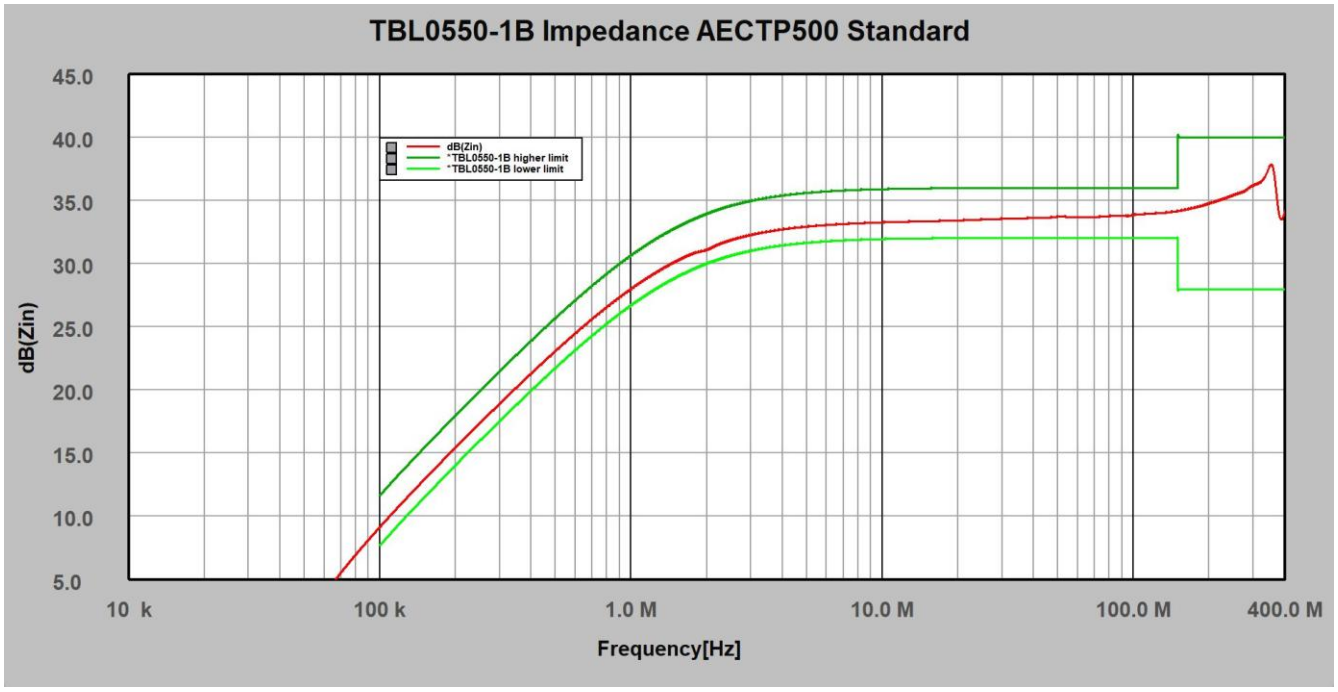


Figure 3: 100 kHz – 400 MHz, logarithmic impedance of the TBL0550-1B 5µH LISN, AECTP-500 limits

5µH Line Impedance Stabilisation Network

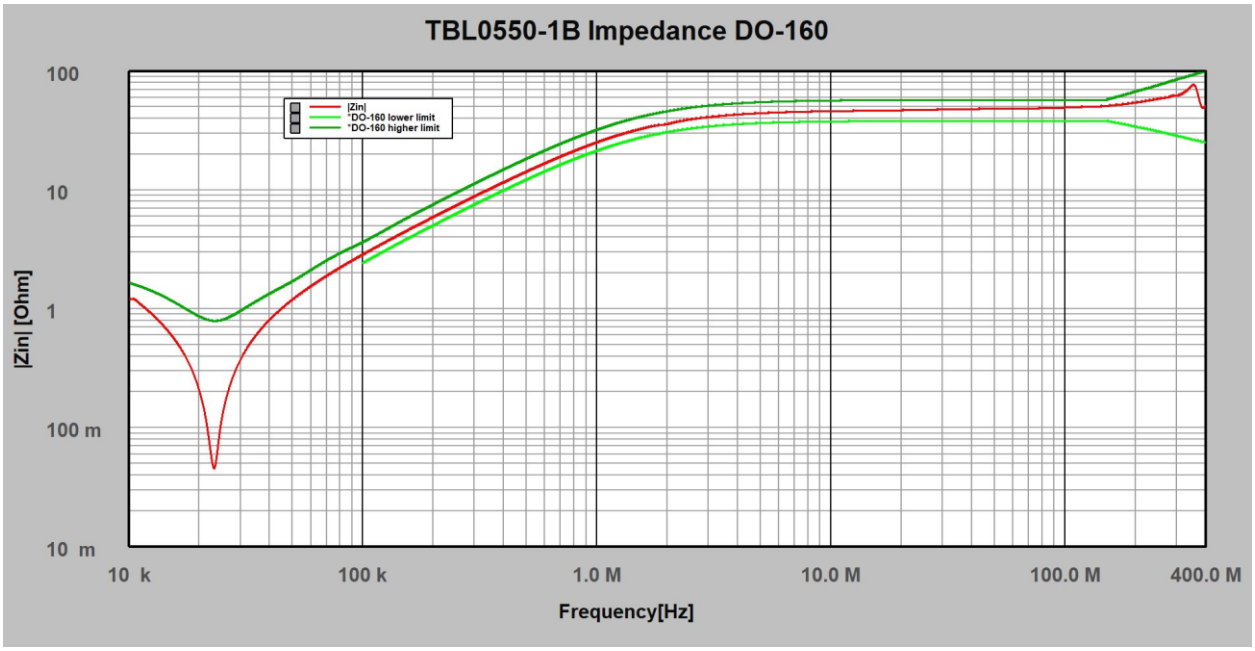


Figure 4: 100 kHz – 400 MHz, impedance of the TBL0550-1B 5µH LISN with additional 10µF capacitor clamped to the source terminals, DO-160 limits

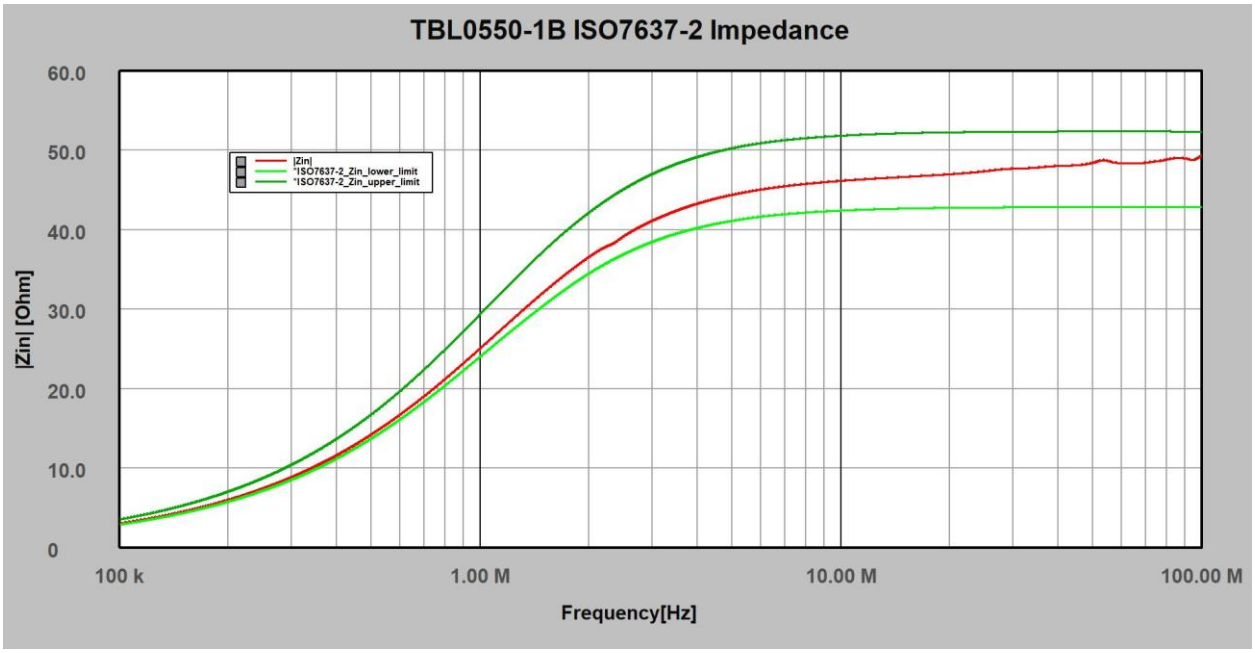


*Figure 5: 100 kHz – 100 MHz, impedance of the TBL0550-1B 5µH LISN, ISO 7637-2 impedance**

6 Isolation

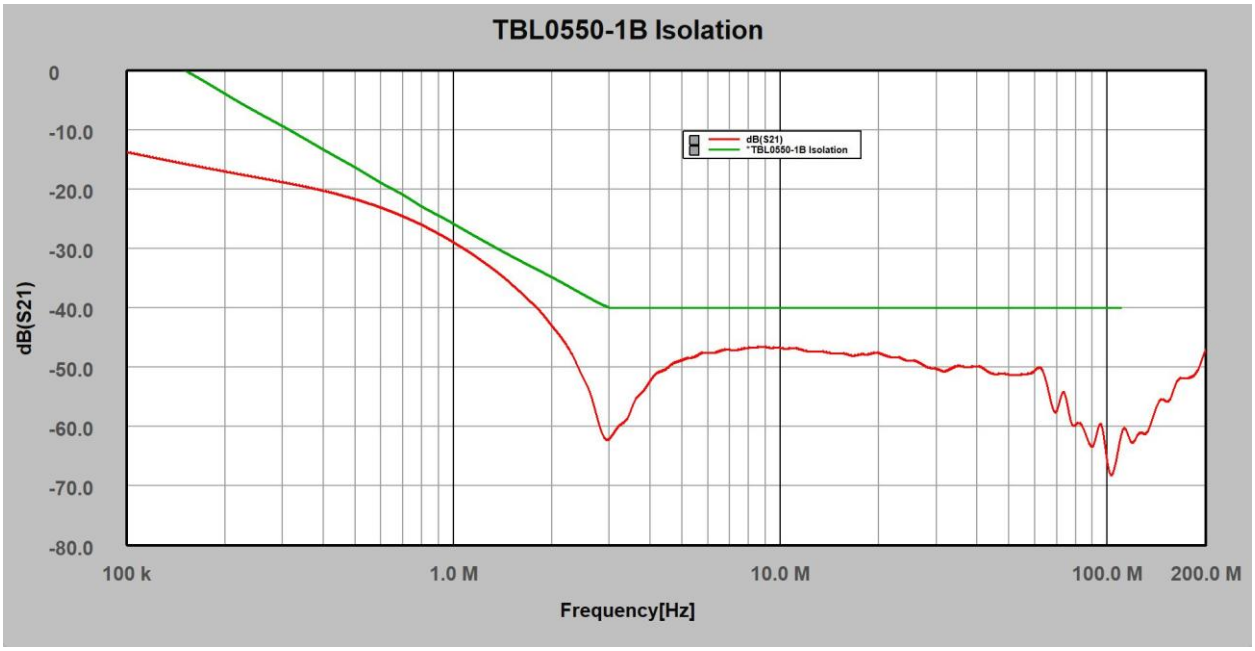


Figure 6: LISN Isolation, 100 kHz – 110MHz, 50Ω // 5µH+1Ω

7 Voltage Division Ratio

Calibration set up according to CISPR 16-1-2 Annex A.8.

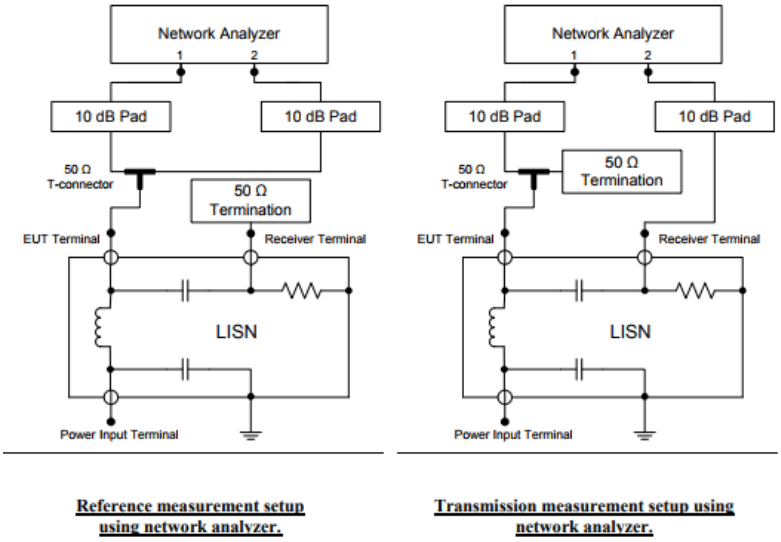


Figure 7 – Calibration set up according to CISPR 16-1-2 Annex A.8.

The voltage division ratio is a correction factor that needs to be applied to the levels measured at the LISN RF output.

5µH Line Impedance Stabilisation Network

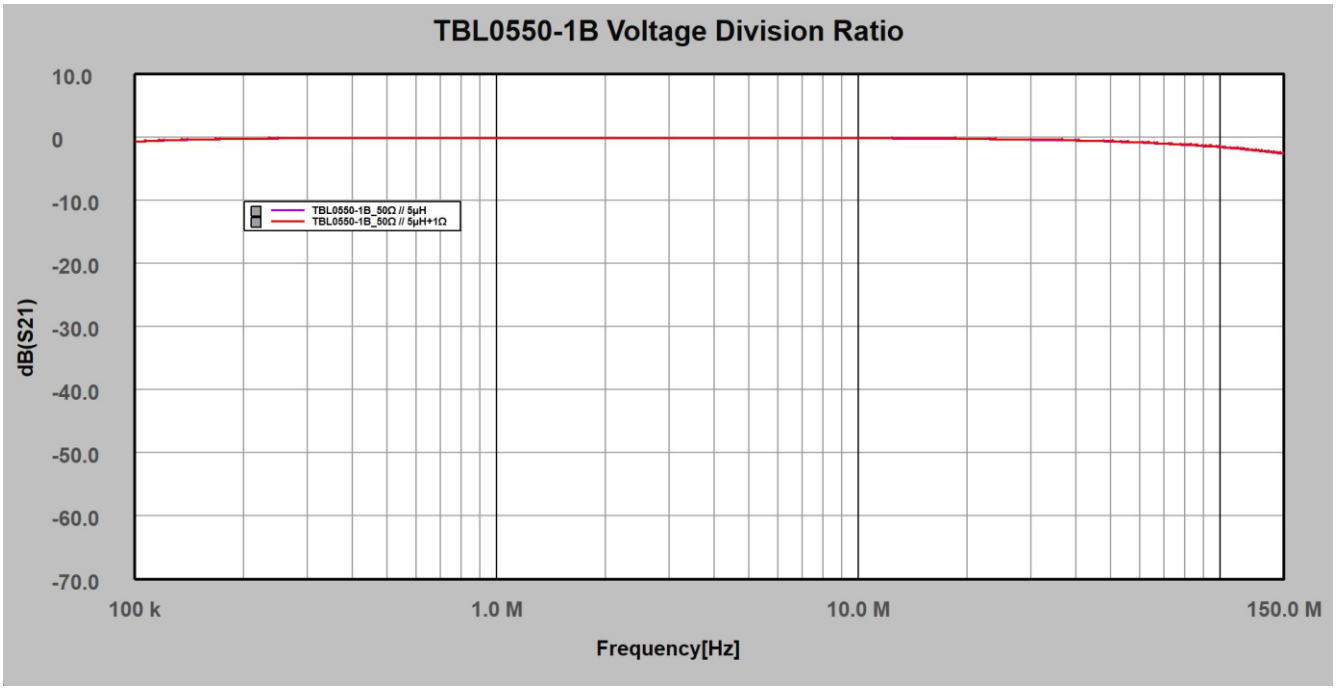


Figure 8: Voltage division ratio EUT terminals to RF connector; 100kHz – 200 MHz; 50Ω // 5µH+1Ω; 50Ω // 5µH

Frequency [MHz]	VDR [dB] 50Ω // 5µH+1Ω	VDR [dB] 50Ω // 5µH	Frequency [MHz]	VDR [dB] 50Ω // 5µH+1Ω	VDR [dB] 50Ω // 5µH
0.1	-0.69	-0.73	10	-0.15	-0.17
0.125	-0.49	-0.49	20	-0.22	-0.25
0.15	-0.36	-0.38	30	-0.41	-0.43
0.175	-0.29	-0.3	40	-0.51	-0.54
0.2	-0.25	-0.26	50	-0.64	-0.68
0.25	-0.19	-0.2	60	-0.82	-0.85
0.5	-0.12	-0.13	70	-1.02	-1.06
0.75	-0.1	-0.12	80	-1.15	-1.21
1	-0.1	-0.11	90	-1.39	-1.43
1.2	-0.1	-0.11	100	-1.53	-1.58
1.5	-0.1	-0.11	110	-1.72	-1.77
2	-0.1	-0.12	120	-1.97	-2.02
2.5	-0.1	-0.12	130	-2.17	-2.22
5	-0.11	-0.13	140	-2.36	-2.43
7.5	-0.13	-0.15	150	-2.57	-2.63

Table 1: 100 kHz – 150 MHz, voltage division

A correction file with the voltage division ratio for use with the EMCview software can be downloaded from the TBL0550-1B product page.

8 Phase

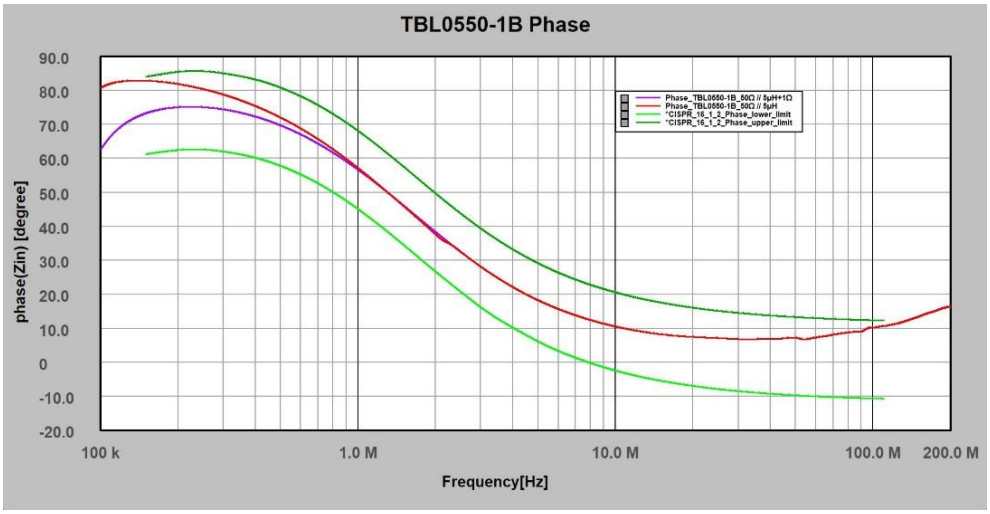


Figure 9: 150 kHz – 110 MHz, Phase angle of impedance with CISPR-16-1-2 limits; the other standards do not specify phase requirements

9 Heat up characteristics

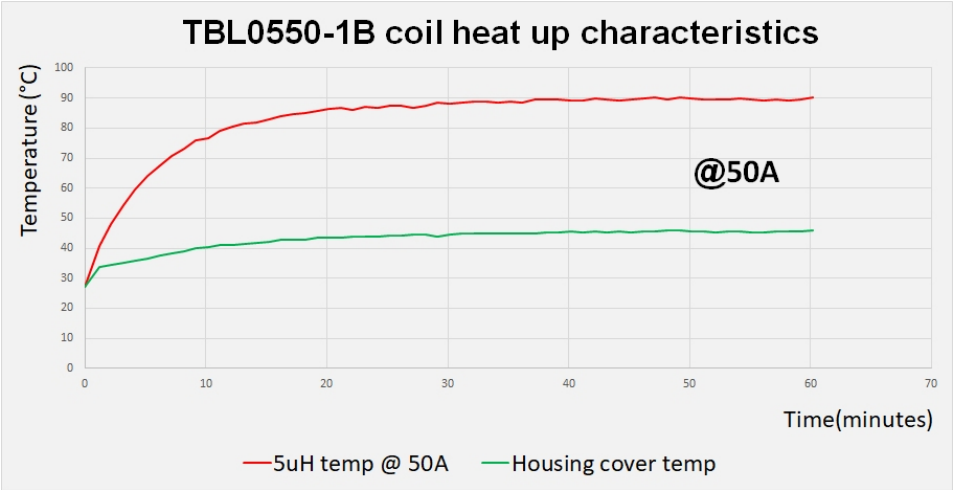


Figure 10: Heat up characteristics of LISN housing and 5µH inductor

The LISN can be continuously loaded with 50A supply current.

10 Source capacitors

DO-160 requires an external 10µF capacitor in parallel to the source terminals. ISO7637-2 requires the internal source capacitors to be disconnected by removing jumpers J1 and J2.

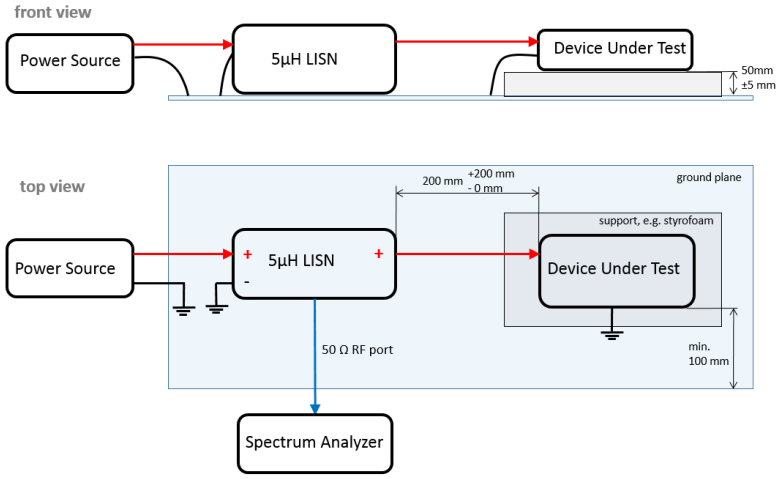
11 Application

Conducted emission measurement setup, voltage method

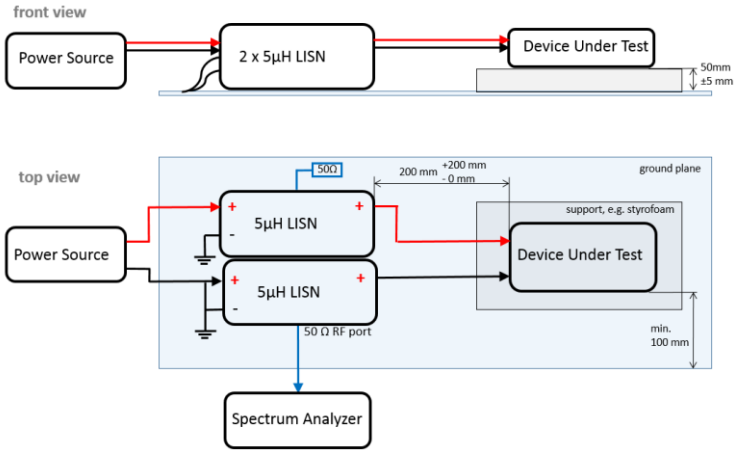
CISPR 25 specifies two measurement configurations:

If the EUT is grounded to the vehicle chassis with a power return line shorter than 20 cm in length, a single LISN is adequate, and the conducted noise is monitored only on the positive supply line.
If the power return line of the EUT is longer than 20 cm, two LISNs are required. One LISN connects the positive supply line to the EUT, and another LISN connects the power return line to the EUT. Conducted noise is measured on both lines. It is actually measured on one LISN at a time, with the other LISN's RF port terminated with a 50 Ohm resistor.

Professional noise measurements are performed in shielded chambers since any ambient noise picked up by the wires connecting LISN to EUT or by the EUT itself will be present at the RF terminal. In pre-compliance setups, a test should be performed with the EUT turned off to distinguish between conducted noise generated by the EUT and emissions from other sources (ambient noise). Tekbox provides low cost, desktop shielded tents or shielded bags to suppress ambient noise for pre-compliance conducted noise measurements.



Picture 13: conducted emission measurement, voltage method, EUT with power return line locally grounded



Picture 14: conducted emission measurement, voltage method, EUT with power return line remotely grounded

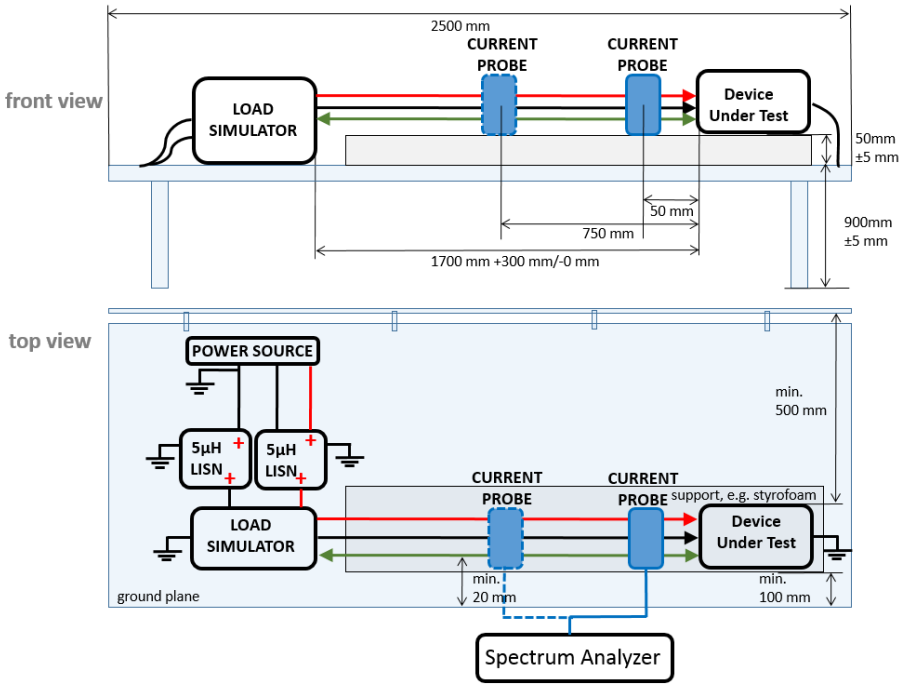
5µH Line Impedance Stabilisation Network

Pictures 13 and 14 depict conducted noise measurement setups using the voltage method, as specified in CISPR 25. If the EUT is connected to additional peripheral devices, they should also be connected or emulated using a load box. If a remotely powered EUT's housing is designed for chassis grounding, it should also be grounded to the ground plane. The grounding lead should be no more than 150mm length.

Because most devices are remotely grounded, the configuration shown in Picture 14 is more frequent. The measurement must then be performed alternately on both the positive and negative power lines. The unused RF port is always terminated with 50 Ohm.

It should be noted that conducted noise testing per DO160 necessitates the insertion of a 10µF capacitor across the LISN's source terminals.

Conducted emission measurement set up, current probe method



Picture 15: conducted emission measurement according to CISPR 25, current probe method

The CISPR 25 current probe measurement is used to monitor conducted emissions on a wire harness, including control/signal lines of an EUT. Some vehicle manufacturers utilise the wide bandwidth of current probes to measure conducted emissions on power supply lines over a wider frequency range than LISNs can. Measurements are typically taken on various lines – plus, minus, control signals, plus + minus, plus + minus + control lines. In order to account for cable harness resonance effects, the current probe is measured at 50 mm and 750 mm distances from the EUT. Each LISN's RF output must be terminated with 50 Ohm. The current probe picks up the conducted emissions. To establish a defined impedance on the power lines, two LISNs are necessary. The load simulator is a specially designed device that simulates the load existing at the EUT's signal/control interface.

Voltage transient testing

The TBL05100-1C can be configured to meet the impedance specifications of ISO 7637-2. Chapter 4 contains the appropriate jumper configuration.

Visit our product website to download application notes related to the setup and use of LISNs. Moreover, you will find many product related video links and other useful information.

12 Ordering Information

Part Number	Description
TBL0550-1B	5µH LISN, 1 pc. 75 cm N-male to N-male RG223 cable Factory calibration certificate and data

Table 3 – Ordering information

Accessories

Part Number	Description
TBL0550-1B-CAL	Calibration kit; calibration adapter BNC-female; OSL calibration box

Picture 16: calibration kit

13 History

Version	Date	Author	Changes
V1.0	14.04.2026	Mayerhofer	Creation of the document
V1.1	15.06.2026	Mayerhofer	Chapter 11 added

Table 4 – History