

Test report

Number: T251-0731/21 **Project file:** C20212324
Date: 2021-10-21
Pages: 25

Product: Industrial Power Supply

Type reference: TIB 120-124

Ratings: Input: 100 – 240 V~; 50 – 60 Hz; 1,50 – 0,78 A
Output: 24 Vdc; 5 A

Trademark: 

Applicant: Traco Power Solutrions Ltd.
Whitemill Industrial Estate Whitemill Road, Wexford Y35 YH66, Ireland

Manufacturer: Traco Power Solutrions Ltd.
Whitemill Industrial Estate Whitemill Road, Wexford Y35 YH66, Ireland

Place of manufacture: Traco Power Solutrions Ltd.
Whitemill Industrial Estate Whitemill Road, Wexford Y35 YH66, Ireland

Summary of testing

Testing method: EN 50121-4:2016 (table 2 – table clauses 2.1, 2.2 and 2.3; table 3 – table clause 3.3; table 5 – table clause 5.3)

Testing location: SIQ Ljubljana, Mašera-Spasićeva ulica 10, SI-1000 Ljubljana, Slovenia

Remarks: Date of receipt of test items: 2021-09-23
Number of items tested: 1
Date of performance of tests: 2021-09-26 - 2021-09-29
The test results presented in this report relate only to the items tested.
The product complies with the requirements of the testing methods.

Tested by: Mitja Rozman



Approved by: Marjan Mak



The report shall not be reproduced except in full.

CONTENTS	page
1 GENERAL	3
1.1 MEASUREMENT UNCERTAINTY	3
1.2 EQUIPMENT UNDER TEST	4
1.3 OPERATING VOLTAGES/FREQUENCIES USED FOR TESTING	12
1.4 OPERATING MODES	12
2 TEST SUMMARY	13
2.1 PERFORMANCE/OBSERVATION CRITERION	14
2.2 APPLICATION OF DECISION RULE	15
3 IMMUNITY	16
3.1 RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)	16
3.2 SURGE IMMUNITY TEST	20
3.3 MAGNETIC FIELD IMMUNITY TEST	23
4 USED TEST EQUIPMENT	25

1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2021-10-21	T251-0731/21	Initial Test Report issued.	--

Environmental conditions:

Ambient temperature: 15 °C to 35 °C

Relative humidity: 30 % to 60 %

Atmospheric pressure: 860 mbar to 1060 mbar

1.1 Measurement uncertainty

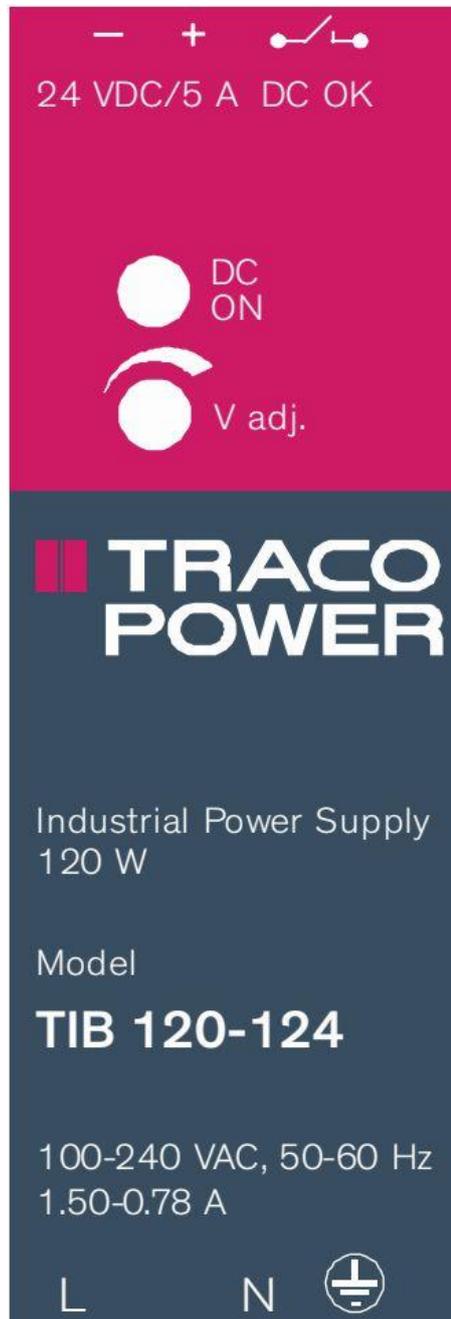
The following measurement uncertainty have been included in test results as specified in each of the basic standards as applicable.

Immunity test	
Radiated electromagnetic field immunity test (RS)	2,2 dB
Surge immunity test	All required parameters comply with requirements of standard.
Magnetic field immunity test	All required parameters comply with requirements of standard.

The measurement uncertainty is calculated in document EN208.

Copy of marking plate

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS that own these marks.

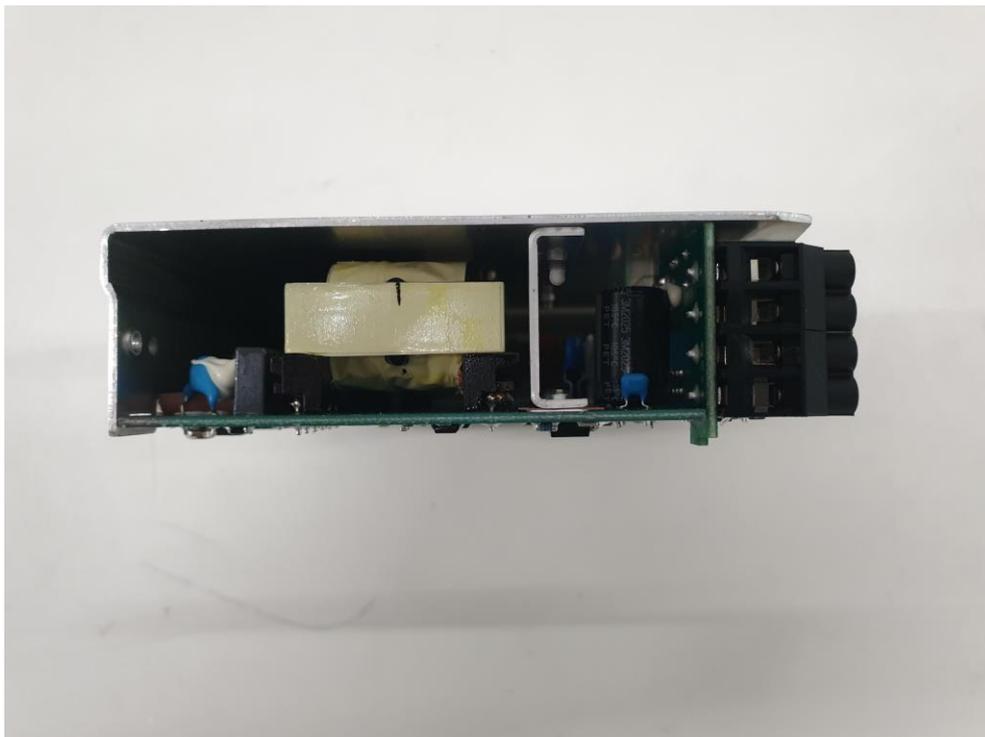
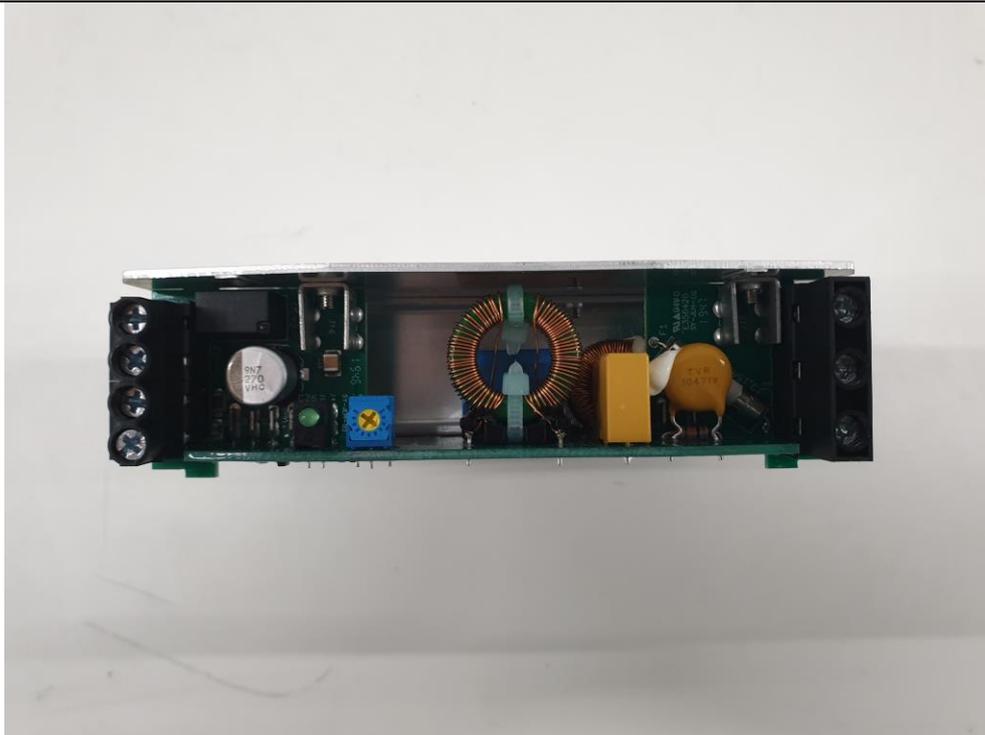


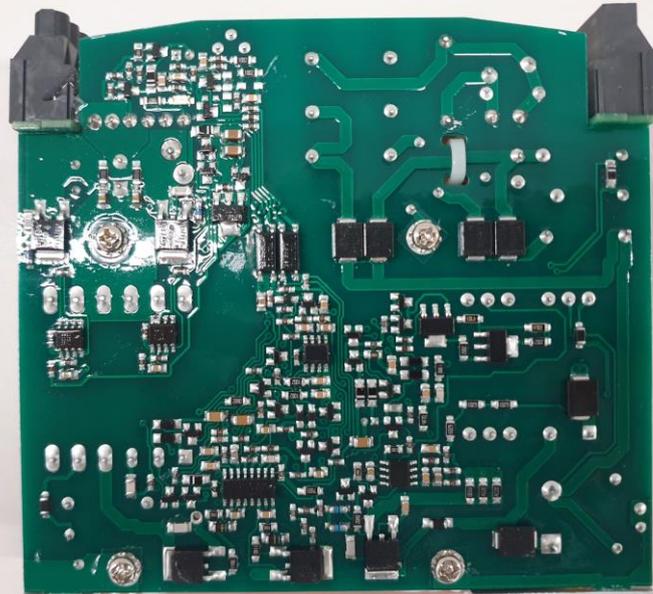
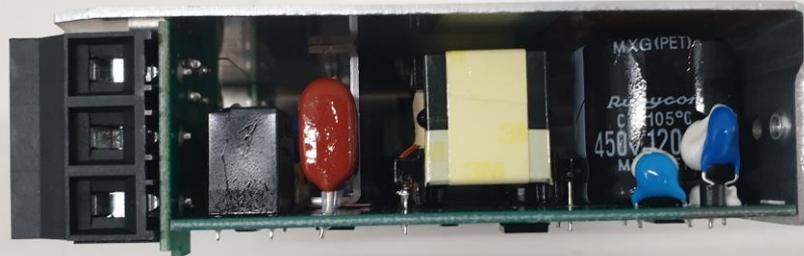
Pictures of EUT



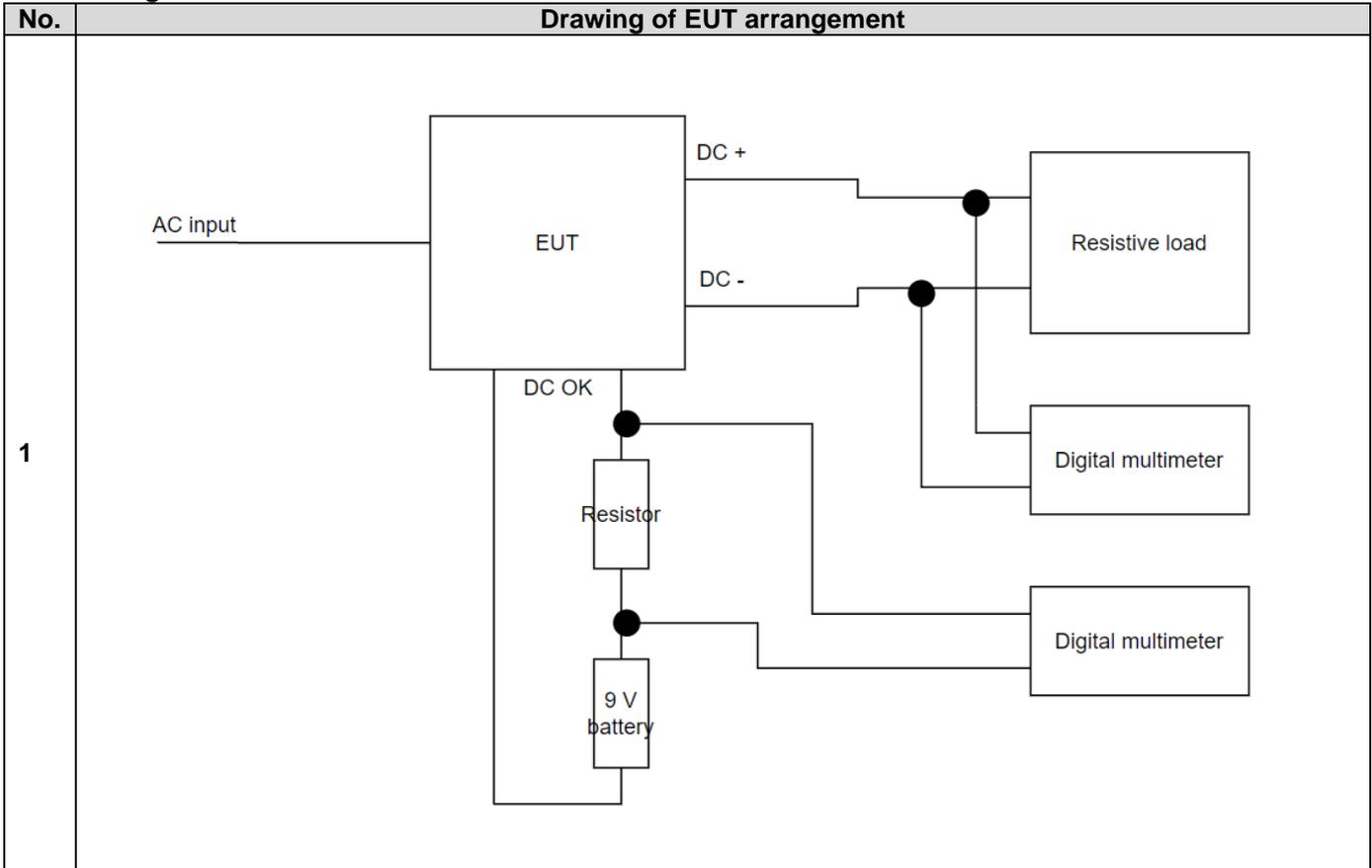








EUT arrangement





1.3 Operating voltages/frequencies used for testing

Section	Test	Operating conditions
3.1	Radiated electromagnetic field immunity test (RS)	230 V; 50 Hz
3.2	Surge immunity test	230 V; 50 Hz
3.3	Magnetic field immunity test	230 V; 50 Hz

1.4 Operating modes

No.	Operating mode
1	Maximum load on DC side (24 Vdc; 5 A)

2 TEST SUMMARY

STANDARDS (details on first page)	Tested		Sample	
	yes	no	pass	not pass
EN 50121-4:2016 Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Test	Basic standard	Required criterion	Achieved criterion	Conclusion
Radio-Frequency Electromagnetic Field	EN 61000-4-3:2006 + A1:2008 + A2:2010	A	A	PASS
Surge	EN 61000-4-5:2014	B	A	PASS
Magnetic field susceptibility	EN 61000-4-8:2010	A	A	PASS

NOTE: for detailed criterion achievement refer to each test separately



2.1 Performance/observation criterion

If there are no special manufacturer performance criteria defined, those bellow are used for evaluation.

Criterion A: The equipment shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Product specific performance criteria

Criterion A: During the test, output voltage shall not deviate more than $\pm 5\%$ of initial value and DC OK signal shall not change state.

Criterion B: Output voltage is allowed to deviate more than $\pm 5\%$ of initial value and DC OK signal is allowed to change state. However after the test, output voltage and DC OK signal must return to initial state without user intervention.

Criterion C: Output voltage is allowed to deviate more than $\pm 5\%$ of initial value and DC OK signal is allowed to change state. However after the test, output voltage and DC OK signal must return to initial state. User intervention is allowed.

Observations during immunity tests

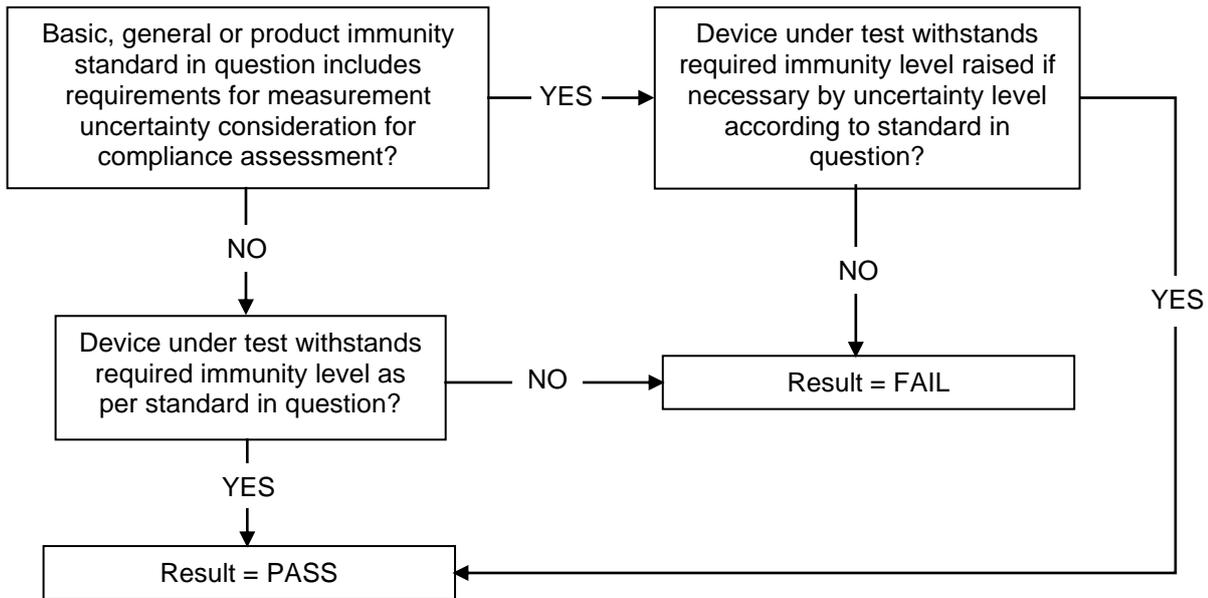
Test	Observation for immunity testing
Radio-Frequency Electromagnetic field immunity (EN 61000-4-3)	Output voltage, DC OK signal
Surge immunity test (EN 61000-4-5)	
Magnetic field Susceptibility (EN 61000-4-8)	

2.2 Application of decision rule

Application of decision rule and statement of conformity is defined in document TN023 Decision rule and measurement uncertainty.

As a general rule Pass/Fail decisions are based on simple acceptance rule and acceptance limits chosen based on simple acceptance ($w = 0$, $AL = TL$) except if a decision rule is governed by particular standard or guidance document.

Decision rule applicable for immunity



3 IMMUNITY

3.1 Radiated electromagnetic field immunity test (RS)

3.1.1 Test specification

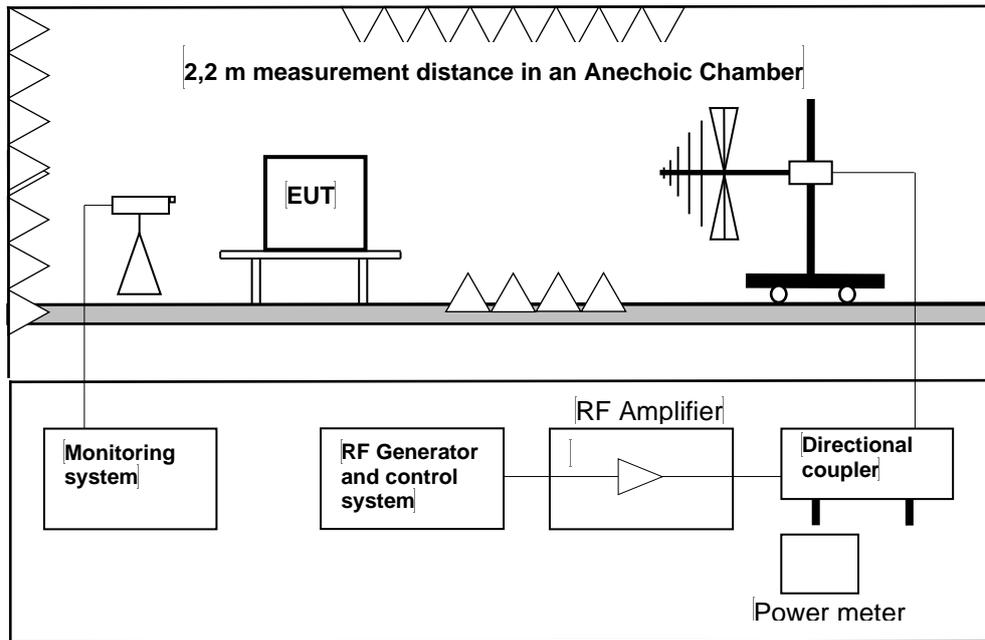
Basic Standard:	IEC 61000-4-3
Frequency Range:	80 – 800 MHz;
Field Strength:	10 V/m
Frequency Range:	800 – 1000 MHz;
Field Strength:	20 V/m
Frequency Range:	1400 – 2000 MHz;
Field Strength:	10 V/m
Frequency Range:	2000 – 2700 MHz;
Field Strength:	5 V/m
Frequency Range:	5100 – 6000 MHz;
Field Strength:	3 V/m
Modulation:	1 kHz Sine Wave, 80 %, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	2,2 m
Antenna Height:	1,75 m

3.1.2 Test procedure

The test procedure was in accordance with IEC 61000-4-3

1. The testing was performed in an anechoic chamber. The transmit antenna was located at a distance of 2,2 meters from the EUT.
2. The frequency range is swept from 80 MHz to 6000 MHz, with the signal 80 % amplitude modulated with 1 kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
3. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
4. The field strength level was 20, 10, 5, 3 V/m.
5. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

3.1.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

The EUT installed in a representative system as described in EN 61000-4-3. The system under test was connected to the power and signal wire according to relevant installation instructions.

3.1.4 Test results

Operating mode:	1				
Frequency	Level	Modulation	Test point	Required criterion	Achieved criterion
80 MHz – 800 MHz	10 V/m	80%	Enclosure	A	A
800 MHz – 1000 MHz	20 V/m	80%	Enclosure	A	A
1400 MHz – 2000 MHz	10 V/m	80%	Enclosure	A	A
2000 MHz – 2700 MHz	5 V/m	80%	Enclosure	A	A
5100 MHz – 6000 MHz	3 V/m	80 &	Enclosure	A	A
Changes in operation observed during testing: no observed changes					



Figure 1: Radiated electromagnetic field immunity test



Figure 2: Radiated electromagnetic field immunity test



Figure 3: Radiated electromagnetic field immunity test



Figure 4: Radiated electromagnetic field immunity test

3.2 Surge immunity test

3.2.1 Test specification

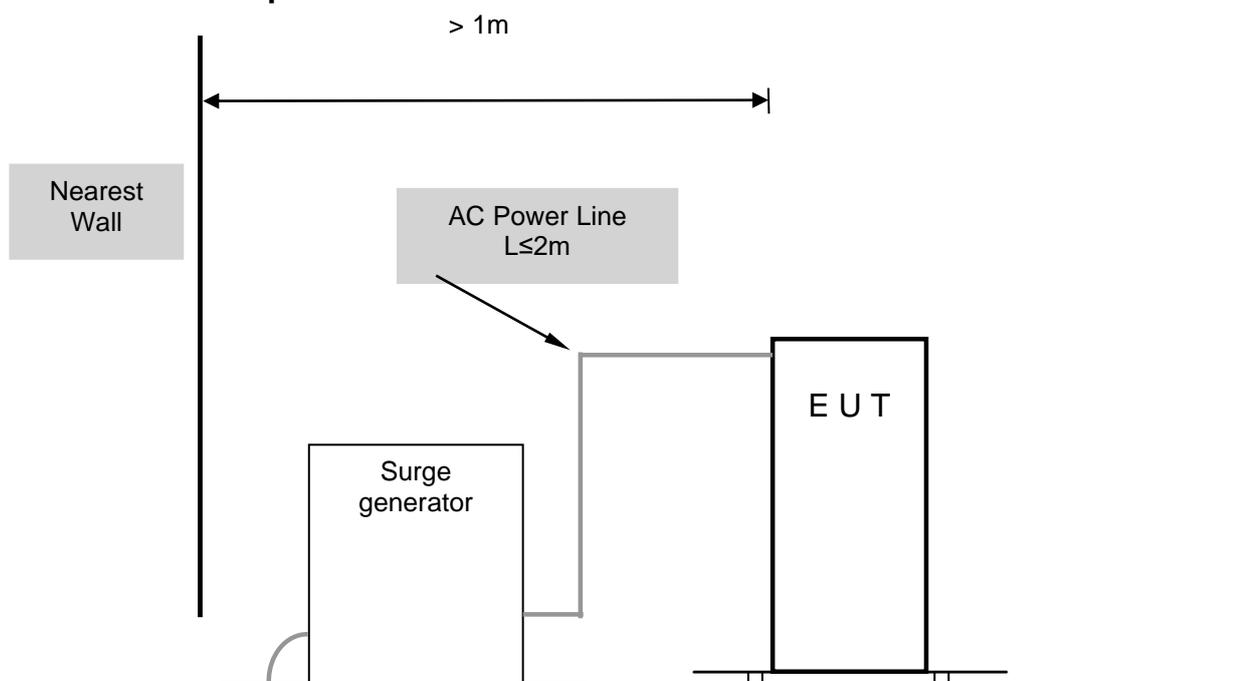
Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave
Test Voltage:	± 2 kV unsymmetrical – Common mode, ± 1 kV symmetrical – Differential mode, 1.2/50 μ s Open Circuit Voltage
Generator Source:	2 ohm between networks 12 ohm between network and ground 40 ohm for signal lines
Polarity:	Positive/Negative
Phase Angle:	$0^\circ / 90^\circ / 180^\circ / 270^\circ$
Pulse Repetition rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

3.2.2 Test procedure

1. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter). The test shall be started with low voltage 0,5 kV and continued with level, which is higher for 0,5 kV.

3.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

3.2.4 Test results

Operating mode:		1			
Test Point	Polarity	Angle (°)	Test Level (kV)	Required criterion	Achieved criterion
L -N	+/-	0, 90, 180, 270	0,5; 1	B	A ¹
L -PE	+/-	0, 90, 180, 270	0,5; 1; 2	B	A ¹
N -PE	+/-	0, 90, 180, 270	0,5; 1; 2	B	A ¹
DC (+) – DC (-)	+/-	/	0,5; 1	B	A ¹
DC (+) – PE	+/-	/	0,5; 1; 2	B	A ¹
DC OK – DC OK	+/-	/	0,5; 1	B	A ¹
DC OK - PE	+/-	/	0,5; 1; 2	B	A ¹

Changes in operation observed during testing:
¹ No observed changes

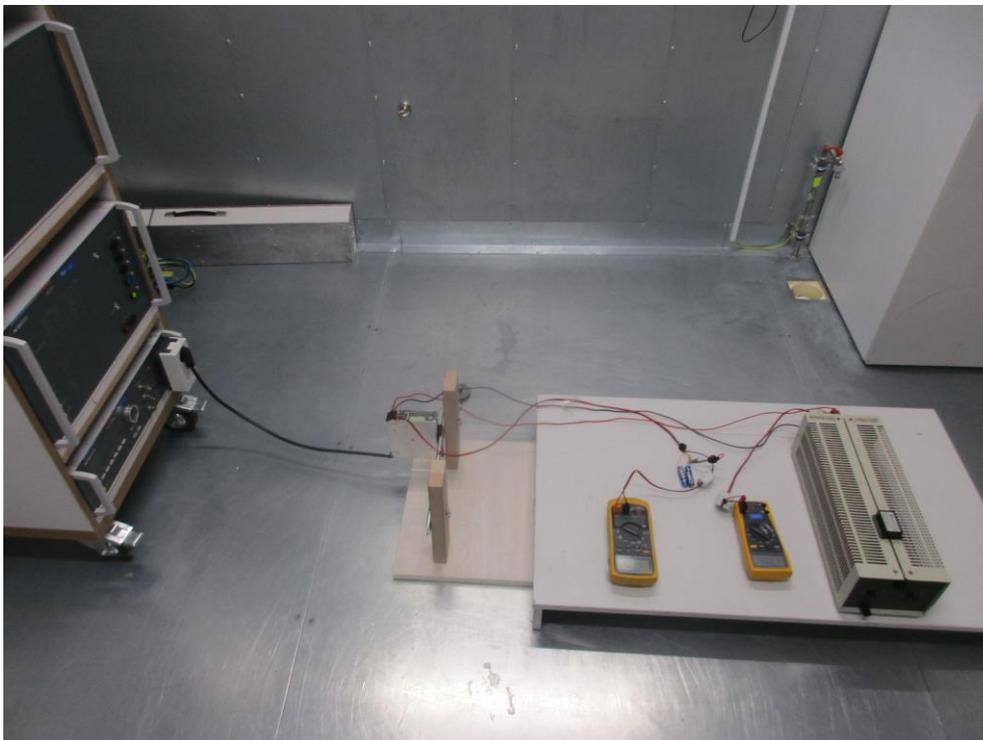


Figure 5: Surge immunity test – AC input

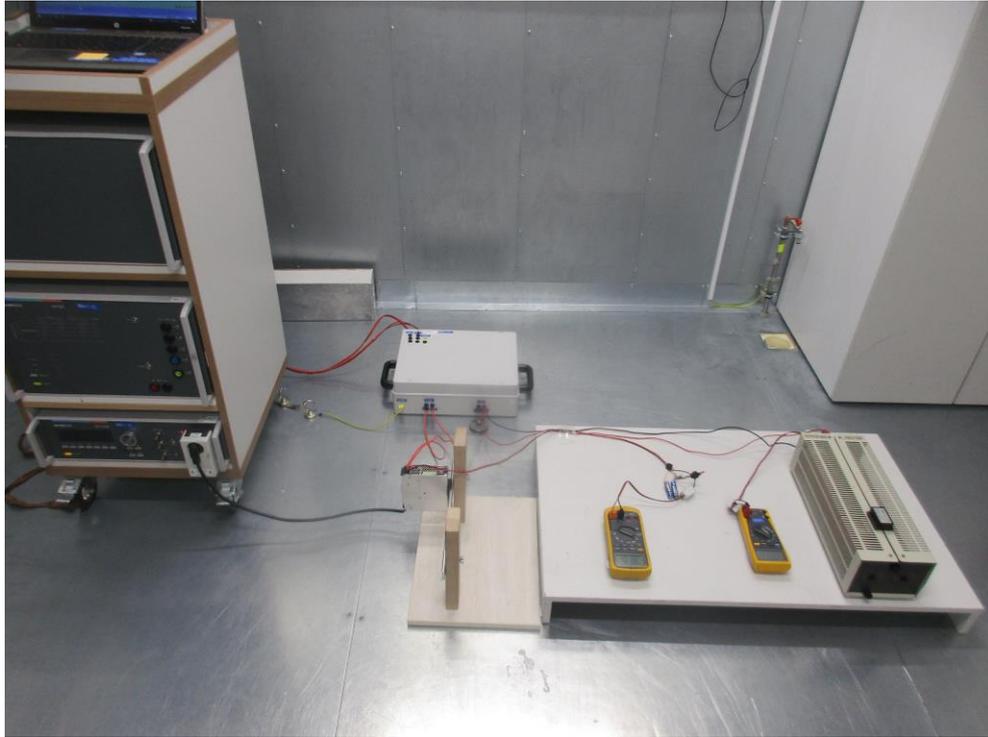


Figure 6: Surge immunity test – DC output

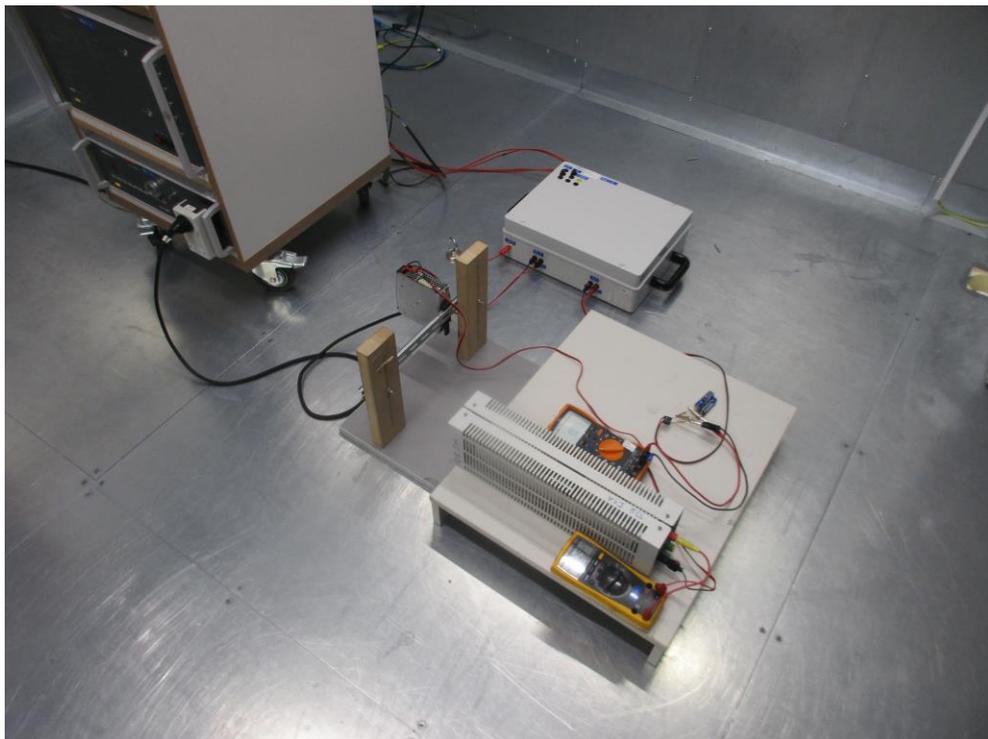


Figure 7: Surge immunity test – DC OK

3.3 Magnetic field immunity test

3.3.1 Test specification

Basic Standard:	IEC 61000-4-8
Frequency Range:	16,7 Hz, 50 Hz, 0 Hz
Field Strength:	100 A/m, 300 A/m

3.3.2 Test procedure

The test procedure was in accordance with IEC 61000-4-8

The EUT was tested with magnetic field antenna

The frequency was set to 16,7 Hz, 50 Hz, 0 Hz

The field strength level was 100 and 300 A/m

The test was performed with the EUT exposed to all three directions (X, Y, Z).

3.3.3 Test setup

The EUT installed in a representative system as described in section 7 EN 61000-4-8 was placed on non-conductive table 0.1 (floor equipment) or 0.8 (table-top equipment) meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

3.3.4 Test results

Operating mode:		1			
Frequency (Hz)	Polarity	Field Strength (A/m)	Test point	Required criterion	Achieved criterion
16,7	X, Y, Z	100	Enclosure	A	A ¹
50	X, Y, Z	100	Enclosure	A	A ¹
0	X, Y, Z	300	Enclosure	A	A ¹
Changes in operation observed during testing: ¹ No observed changes					

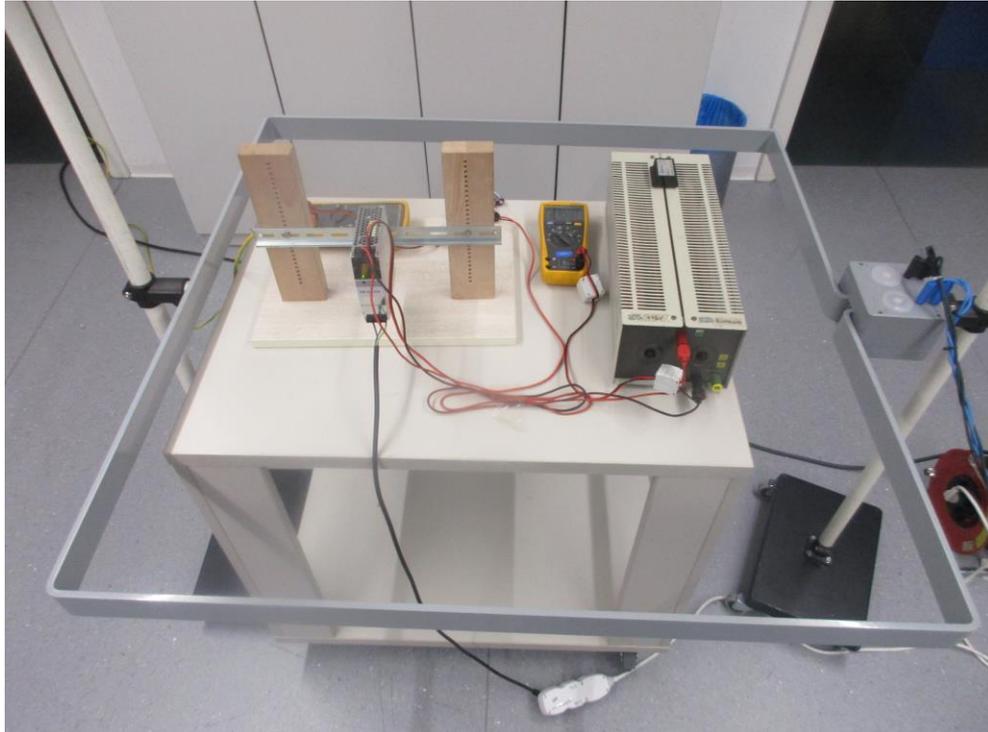


Figure 8: Magnetic field immunity test

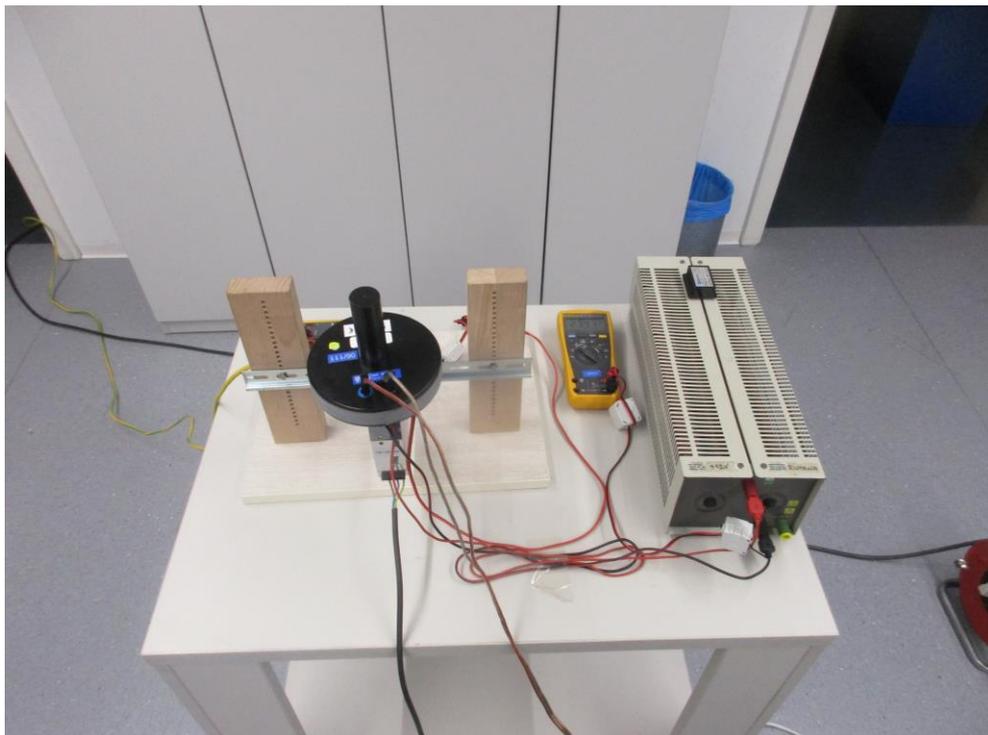


Figure 9: Magnetic field immunity test

4 USED TEST EQUIPMENT

3.1 Radiated electromagnetic field immunity test (RS)

Whole frequency range except 800 – 1000 MHz

Equipment	Type	SIQ Number	Manufacturer	Calibrated until
SAC 2	SAC 3m	109071	Comtest Engineering	2022-06
RF and Microwave Signal Generator	SMB100A	109054	R&S	2022-05
Signal Generator	SMBV100A	109060	R&S	2022-07
Ultra Broadband Antenna (SAC1)	HL562E	109063	R&S	N/A
Horn Antenna (SAC1)	HF907	109064	R&S	N/A
Digital Multimeter	87V	108651	Fluke	2021-11
Digital Multimeter	179	108102	Fluke	2022-11

In frequency range 800 – 1000 MHz

Equipment	Type	SIQ Number	Manufacturer	Last due date
SAC 1	SAC 3m	109070	Comtest Engineering	2022-06
Signal Generator	SMB100A	/	R&S	2022-11
Signal Generator	SMBV100B	/	R&S	2022-11
Horn Antenna (SAC2)	HF907	109057	R&S	N/A
Antenna	HL046E	100219	R&S	N/A
Digital Multimeter	87V	108651	Fluke	2021-11
Digital Multimeter	179	108102	Fluke	2022-11

3.2 Surge immunity test

Equipment	Type	SIQ Number	Manufacturer	Last due date
Ultra Compact Simulator	UCS 500 N5	106887	EM Test	2022-07
CDN	CDN 40 Ohm	/	SIQ	2022-11
Digital Multimeter	87V	108651	Fluke	2021-11
Digital Multimeter	179	108102	Fluke	2022-11
Digital Multimeter	U1242C	/	Keysight	2022-07

3.3 Magnetic field immunity test

Equipment	Type	SIQ Number	Manufacturer	Last due date
Current transformer	MC 2630	106893	EM TEST	2021-12
Magnetic field coil	MS100N	106892	EM Test	2022-03
Radiating Loop	RL_120	106969	EM TEST	2022-10
Digital Multimeter	87V	108651	Fluke	2021-11
Digital Multimeter	179	108102	Fluke	2022-11