

Traco Power

Model: TIB 080-148*

Railway - Test Report

**EN 50121-4 Railway applications. Electromagnetic compatibility.
Emission and immunity of the signalling and telecommunications
apparatus.**

**EN 50121-3-2 Railway applications. Electromagnetic compatibility.
Emission and immunity. Rolling stock. Apparatus.**

EUT: Traco Power - Model: TIB 080-148

Serial No.: 21802100034/21835064794

Manufacturer No.: 080PSX185

Manufacturer: Traco Power Solutions Ltd.
Whitemill Industrial Estate
Wexford
Republic of Ireland

Tester(s): Shaun Foley, Barry O Reilly, Traco Power
Solutions Ltd

Date: 15/03/2019

***Also covers models with EX designation**

It should be noted, that combining two or more CE compliant finished appliances does not automatically produce a compliant system. The manufacturer of an apparatus or a fixed installation as defined in the “Guide for the EMC Directive 2004/108EC, 21. May 2007” is responsible for the EMC-compliance of the final apparatus.

Table of Contents

| | |
|--|----|
| 1. Conducted Emissions at Mains Terminals | 3 |
| 1.1. Test Setup | 3 |
| 1.2. Conducted Emissions Test Results (Mains Terminals) | 4 |
| 2. Conducted Emissions Measurements at DC output Terminals | 5 |
| 2.1. Test Setup | 5 |
| 2.2. Conducted Emissions Test Results (DC output Terminals) | 6 |
| 3. Harmonic Current Emissions Measurement at Mains Terminal | 7 |
| 3.1. Test Setup | 7 |
| 3.2. Harmonic Current Emissions Test Results | 8 |
| 4. Electrostatic Discharge Immunity Test | 9 |
| 4.1. Test Set-Up | 9 |
| 4.2. Electrostatic Discharge Immunity Test Results | 10 |
| 5. Surge Voltage Immunity Test | 11 |
| 5.1. Test Setup | 11 |
| 5.2 Surge Voltage Immunity Test Results | 12 |
| 6. Fast Transient Voltage Immunity Test (Burst) | 13 |
| 6.1. Test Setup | 13 |
| 6.2. Fast Transient Voltage Immunity Test (Burst) Results | 14 |
| 7. Conducted RF Immunity Test at AC Mains Terminals | 15 |
| 7.1. Test Setup | 15 |
| 7.2. Conducted RF Immunity Test at AC Mains Terminals Results | 16 |
| 8. Conducted RF Immunity Test at DC Output Terminals | 17 |
| 8.1. Test Setup | 17 |
| 8.2. Conducted RF Immunity Test at DC Output Terminals Results | 18 |
| 9. Radiated RF Immunity Test | 19 |
| 9.1. Test Setup | 19 |
| 9.2. Radiated RF Immunity Test Results | 20 |
| 10. Power Frequency Magnetic Field Immunity Test | 21 |
| 10.1. Test Setup | 21 |
| 10.2. Power Frequency Magnetic Field Immunity Test Results | 22 |
| 11. Summary EN 50121-4 | 23 |
| 12. EN 50121-3-2 Railway applications. | 24 |
| 13. Summary EN 50121-3-2 | 24 |
| 14. List of Equipment Used | 26 |

1. Conducted Emissions Measurement at Mains Terminals

Equipment under Test: TIB 080-148
EUT Serial No.: 21802100034
Customer Spec: XXXPSX184
Date: 30/01/2018
Standards: EN50121-4: 2016 referring to CISPR 16-2-1: 2005

Notes:

- The unit passes CISPR 16-2-1 Class B limits therefore it also passes the railway requirement CISPR 16-2-1 with higher Class A limits. The results below are extracted from the standard Traco Power EMC test report.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Emissions measured using Agilent E7402A EMC Analyzer and LISN Schwarzbeck NSLK 8127.
- Tested to IEC 61000-6-3: Ed 2.1 Class B limits.
- Transient limiter is used to protect the Agilent E7402A, with appropriate correction factors applied.
- Tests carried out in a shielded room.

1.1. Test Setup

Test Equipment Settings:

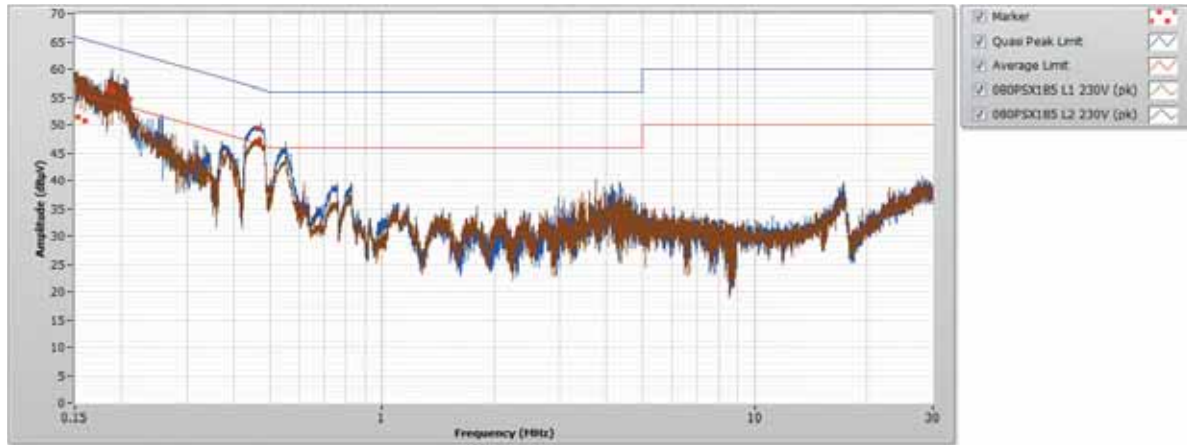
| Start Freq. | Stop Freq. | Pk Time | Qpk Time | Avg Time |
|-------------|------------|---------|----------|----------|
| 150kHz | 30MHz | 200ms | 200ms | 200ms |

Test Setup:



1.2. Conducted Emissions Test Results (Mains Terminals)

L and N



Measurement-List

| Trace | Frequency (MHz) | Peak (dBμV) | Quasi Peak (dBμV) | Average (dBμV) | Delta Quasi Peak (dBμV) | Delta Average (dBμV) |
|------------------------|-----------------|-------------|-------------------|----------------|-------------------------|----------------------|
| 080PSX185 L2 230V (pk) | 0.150 | 58.320 | 51.340 | 25.680 | -14.500 | -30.16 |
| 080PSX185 L2 230V (pk) | 0.190 | 58.350 | 56.500 | 44.440 | -7.720 | -9.78 |
| 080PSX185 L2 230V (pk) | 0.460 | 50.880 | 49.210 | 36.320 | -7.400 | -10.29 |
| 080PSX185 L1 230V (pk) | 0.160 | 59.550 | 50.760 | 24.320 | -14.710 | -31.15 |
| 080PSX185 L1 230V (pk) | 0.190 | 60.480 | 56.200 | 44.100 | -7.910 | -10.01 |
| 080PSX185 L1 230V (pk) | 0.210 | 58.490 | 54.650 | 41.840 | -8.750 | -11.56 |
| 080PSX185 L1 230V (pk) | 0.470 | 48.950 | 47.150 | 34.060 | -9.410 | -12.5 |

Table 1 - Average and Quasi Peak Measurements of the TIB 080-112

Remarks:

The Brown graph represents peak measurements of Live and the Blue graph represents peak measurements of Neutral. Quasi peak and average measurements are measured if the peak measurement is above the relevant limit. See Table 1..

PASS

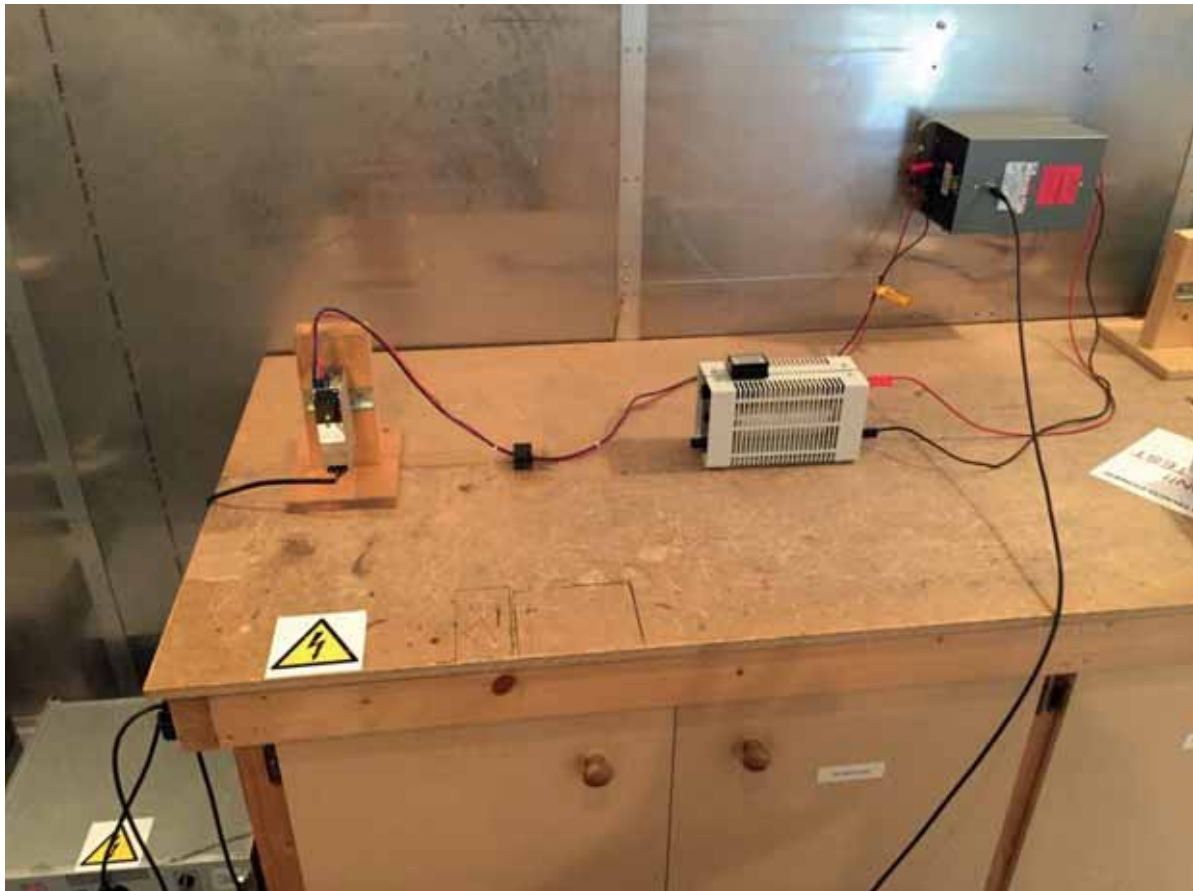
2. Conducted Emissions Measurements at DC output Terminals

Equipment under Test: TIB080-148
EUT Serial No.: 21802100034
Customer Spec: CS-XXXPSX18X
Date: 24/10/2018
Standards: EN50121-4: referring to CISPR 16-2-1: 2005

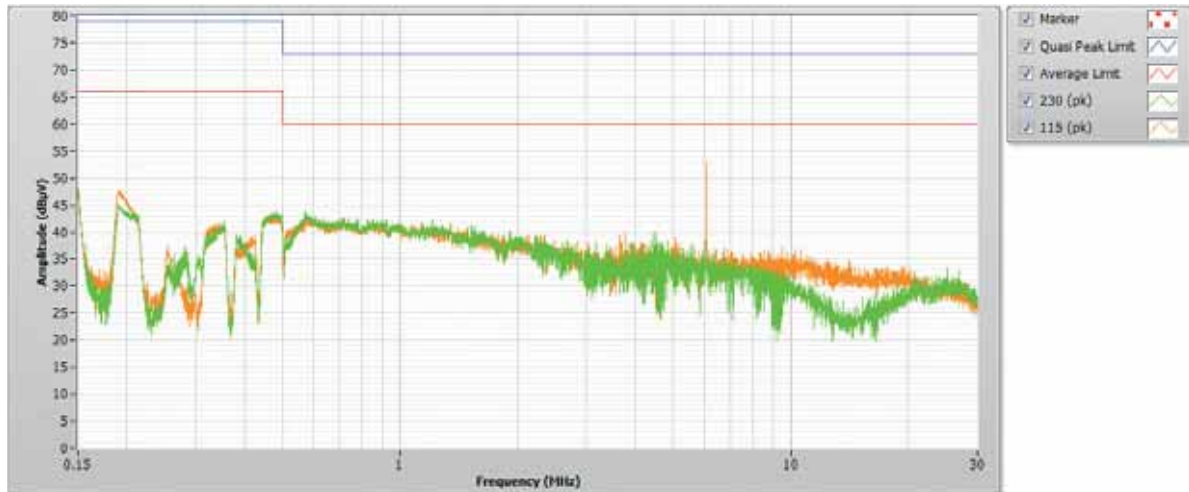
Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Emissions measured using Agilent E7402A and FCC-801-M2-50A Coupling/Decoupling network.
- Tested to EN50121-4 limits.
- Transient limiter used to protect Agilent E7402A, with appropriate correction factors applied.
- Appropriate correction factors also applied for output Coupling/Decoupling network.
- Tests carried out in a shielded room.

2.1. Test Setup



2.2. Conducted Emissions Test Results (DC output Terminals)



Measurement-List

Table 2 - Average and Quasi Peak Measurements of the TIB080-148

PASS

3. Harmonic Current Emissions Measurement at Mains Terminal

Equipment under Test: TIB 080-148
EUT Serial No.: 21802100034
Customer Spec: XXXPSX184
Date: 30/01/2018
Standards: EN50121-4: 2016 referring to IEC 61000-3-2: 2005

Notes:

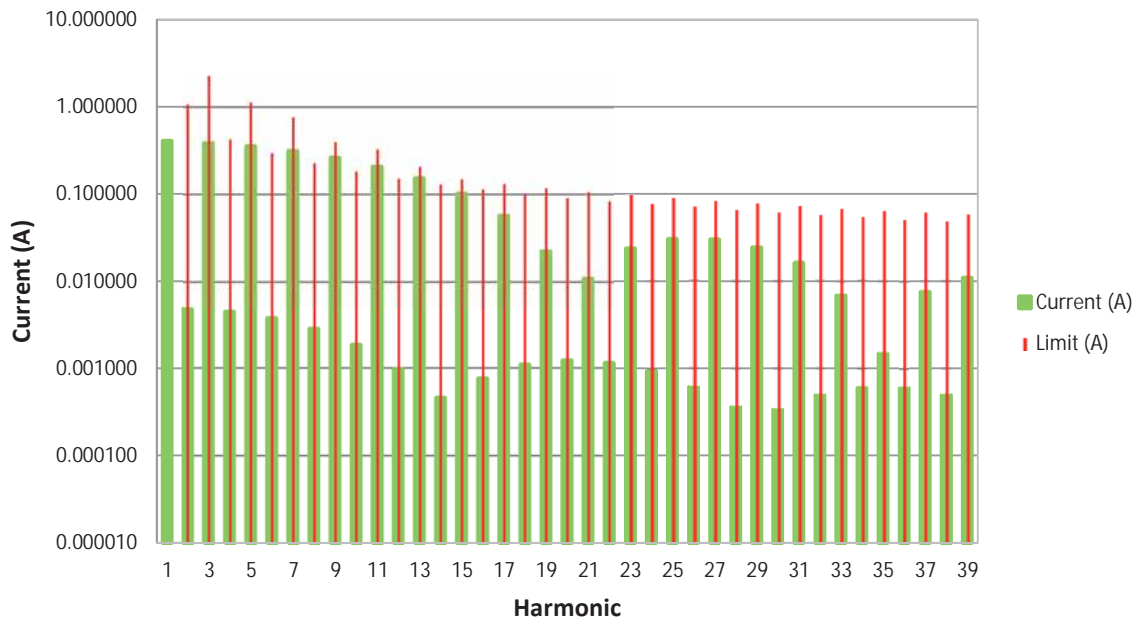
- This railway standard has the same requirements as IEC61000-6-3: 2011. The results below are extracted from the standard Traco Power EMC test report.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- EUT powered by low-distortion AC Voltage Source, TTI AC-1000.
- Harmonic Limits measured using LMG 95 Power Meter.
- Tested to IEC61000-3-2 Table 1 Class A.

3.1. Test Setup



3.2. Harmonic Current Emissions Test Results

Harmonic Measurements



| Harmonic | Current (A) | Limit (A) | Harmonic | Current (A) | Limit (A) |
|----------|-------------|-----------|----------|-------------|-----------|
| 0 | 0.006090 | | 20 | 0.001850 | 0.092000 |
| 1 | 0.412930 | | 21 | 0.009570 | 0.107143 |
| 2 | 0.008280 | 1.080000 | 22 | 0.001730 | 0.083636 |
| 3 | 0.393890 | 2.300000 | 23 | 0.022910 | 0.097826 |
| 4 | 0.007460 | 0.430000 | 24 | 0.001350 | 0.076667 |
| 5 | 0.363360 | 1.140000 | 25 | 0.030150 | 0.090000 |
| 6 | 0.006280 | 0.300000 | 26 | 0.000830 | 0.070769 |
| 7 | 0.320720 | 0.770000 | 27 | 0.030190 | 0.083333 |
| 8 | 0.004780 | 0.230000 | 28 | 0.000400 | 0.065714 |
| 9 | 0.269550 | 0.400000 | 29 | 0.024960 | 0.077586 |
| 10 | 0.003200 | 0.184000 | 30 | 0.000540 | 0.061333 |
| 11 | 0.213940 | 0.330000 | 31 | 0.016720 | 0.072581 |
| 12 | 0.001710 | 0.153333 | 32 | 0.000860 | 0.057500 |
| 13 | 0.157960 | 0.210000 | 33 | 0.007520 | 0.068182 |
| 14 | 0.000760 | 0.131429 | 34 | 0.001030 | 0.054118 |
| 15 | 0.105560 | 0.150000 | 35 | 0.000850 | 0.064286 |
| 16 | 0.001120 | 0.115000 | 36 | 0.001020 | 0.051111 |
| 17 | 0.059980 | 0.132353 | 37 | 0.007140 | 0.060811 |
| 18 | 0.001650 | 0.102222 | 38 | 0.000830 | 0.048421 |
| 19 | 0.023940 | 0.118421 | 39 | 0.010790 | 0.057692 |

PASS

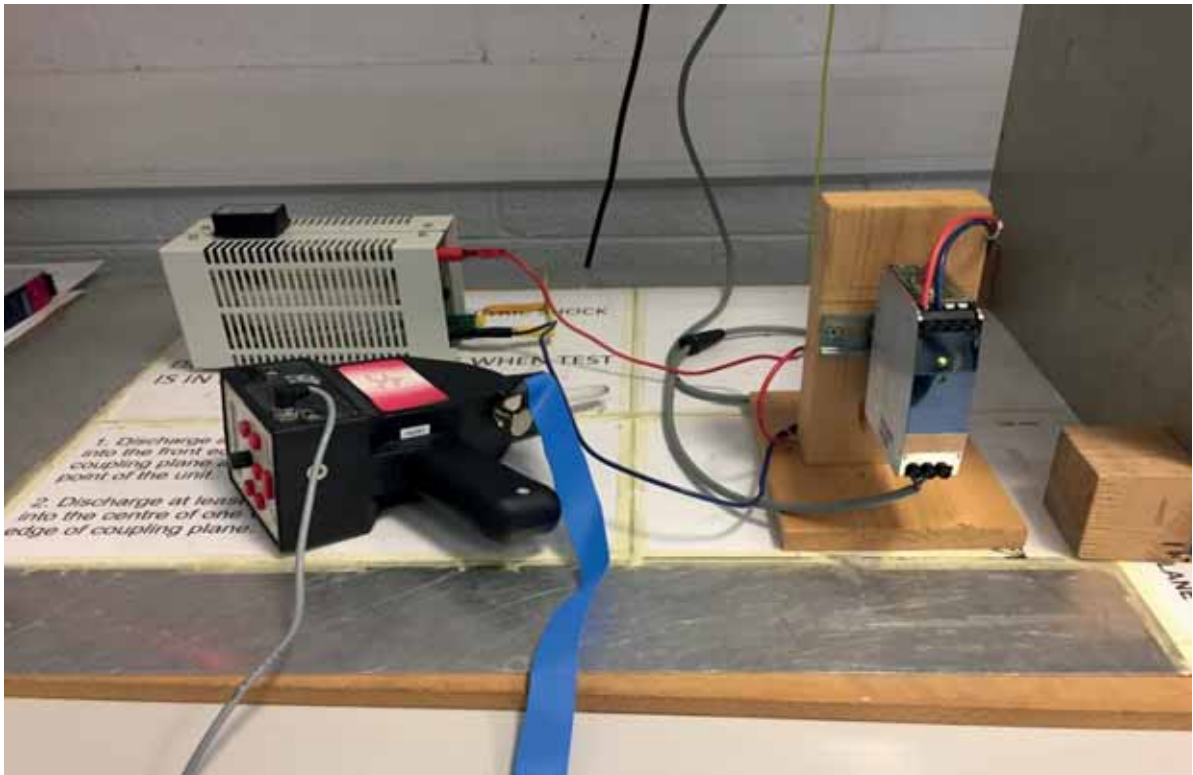
4. Electrostatic Discharge Immunity Test

Equipment under Test: TIB 080-148
EUT Serial No.: 21835064794
Customer Spec: XXXPSX184
Date: 26/10/2018
Standards: EN50121-4: 2016 referring to IEC 61000-4-2: 2000

Notes:

- EN50121-4 test values 8kV/6kV (air/contact).
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Since the EUT output is isolated from earth, a 470K HV resistor was placed between output and Earth to provide a discharge path between spikes.
- Contact discharge tests shall be applied to all areas exposed to the end user under final installation using ESD gun SESD 200.
- Test voltage shall be increased from 2kV up to the max 8kV/6kV (air/contact) as required by the standard IEC/EN 61000-4-2.
- At least 10 discharges were applied per test point (in both polarities).
- A time interval between discharges of a least 1s was used.
- The ESD generator was held perpendicular to the test point wherever possible for repeatability of results.
- In the case of air discharges, the trigger is engaged at about 20cm and the tester is moved quickly toward the test point until a spark occurs and trigger is released.

4.1. Test Set-Up



4.2. Electrostatic Discharge Immunity Test Results

All exposed metal screw heads and ground planes were tested as contact test points and also as air test points. The connector pins and all vents and inlets were also tested as air test points.

| | Contact Test points: | Air Test points: |
|-----|----------------------|------------------|
| EUT | PASS | PASS |

Conclusion:

The EUT still functions as expected after tests therefore it meets performance criteria B in accordance with EN 50121-1: 2017.

PASS

Environmental conditions during ESD Test

| | Environmental condition required according IEC61000-4-2 | Environmental conditions measured |
|-------------------------------|---|-----------------------------------|
| Ambient Temperature in [°C] | 15 - 35 | 21.6 |
| Air Humidity in [%] | 30 - 60 | 39.0 |
| Atmospheric Pressure in [kPa] | 86.0 - 106.0 | 100.88 |

Environmental conditions during the test:

☒ kept

☐ not kept

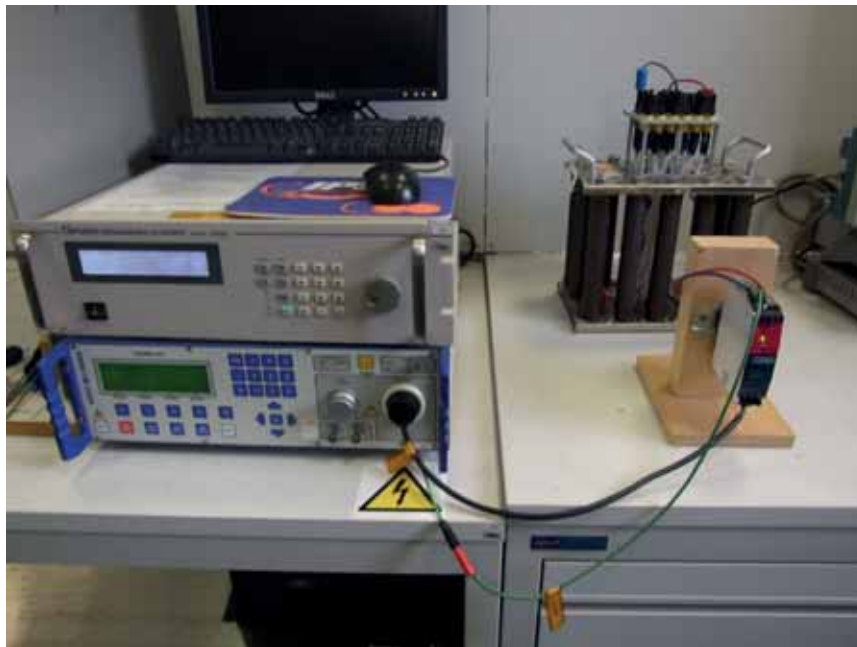
5. Surge Voltage Immunity Test

Equipment under Test: TIB 080-148
EUT Serial No.: 21802100034
Customer Spec: XXXPSX184
Date: 03/10/2018
Standards: EN50121-4: 2016 referring to IEC 61000-4-5: 2005

Notes:

- This railway standard requires testing to IEC 61000-4-5 with higher DC port test values than IEC61000-6-2: 2005. The results below are extracted from the standard Traco Power EMC test report for AC port testing only.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Used Haefely Surge generator PSURGE 4010.
- Voltage test level: AC port Line-Line +/- 1kV, AC port Line-Earth +/- 2kV (installation class 3).
- DC ports Line-Line & DC ports Line-Earth +/- 2kV & Signal Ports Line-Earth +/- 1kV (Not tested due to lack of suitable equipment).
- No. of Surges per set: 5 tests Positive and 5 tests Negative.
- Interval between surges: 10s.

5.1. Test Setup



5.2. Surge Voltage Immunity Test Results

| | AC Line to Line | AC Line to PE | DC Line to Line | DC Line to PE |
|-----|-----------------|---------------|-----------------|---------------|
| EUT | PASS | PASS | Not tested | Not tested |

Conclusion:

The EUT meets performance criteria B as required by EN50121-1: 2017 Section 3.

PASS

6. Fast Transient Voltage Immunity Test (Burst)

Equipment under Test: TIB 080-112
EUT Serial No.: 21835064794
Customer Spec: XXXPSX184
Date: 24/10/2018
Standard: EN50121-4: 2016 referring to IEC 61000-4-4: 2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Units tested to IEC61000-4-4 test level 3.
- Used Haefely Burst tester PEFT 4010.
- AC & DC Power ports and Signal Ports Voltage test level: +/-2kV.
- Earth Port Voltage test level: +/-1kV.
- Burst Duration: 0.75ms.
- Spike frequency: 5kHz.
- Burst Period: 300ms.
- Individual test time: 1 min.
- Polarity: Positive and Negative.

The Output lines and Signal lines were tested to the above mentioned limits with Haefely coupling capacitor IP4A.

6.1. Test Setup



6.2. Fast Transient Voltage (Burst) Test Results.

| EUT: | L-G | N-G | PE-G | L, N-G | L,PE-G | N,PE-G | L, N,PE-G | Outputs -G | Signals -G |
|----------|------|------|------|--------|--------|--------|-----------|------------|------------|
| Positive | PASS | PASS | PASS | PASS | PASS | PASS | PASS | PASS | PASS |
| Negative | PASS | PASS | PASS | PASS | PASS | PASS | PASS | PASS | PASS |

Conclusion:

The EUT meets performance criteria A, defined as $V_{out} > DC\ OK\ Limit$ (see specification) during the test, as required by EN50121-1: 2017 Section 3.

PASS

7. Conducted RF Immunity Test at AC Mains Terminals

Equipment under Test: TIB 080-148
EUT Serial No.: 21835064794
Customer Spec: XXXPSX184
Date: 30/10/2018
Standard: EN50121-4: 2016 referring to IEC 61000-4-6:2004

Notes:

- This railway standard requires testing to IEC61000-4-6: 2004 but with an additional Earth Port measurement not needed for IEC61000-6-2:2005.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75” and measurement instrument “Agilent 34410A”.
- Unit tested to IEC61000-4-6 test level 3.
- CDN switch set to M2 for L,N testing and M3 for Earth Port (PE) testing.

7.1. Test Setup

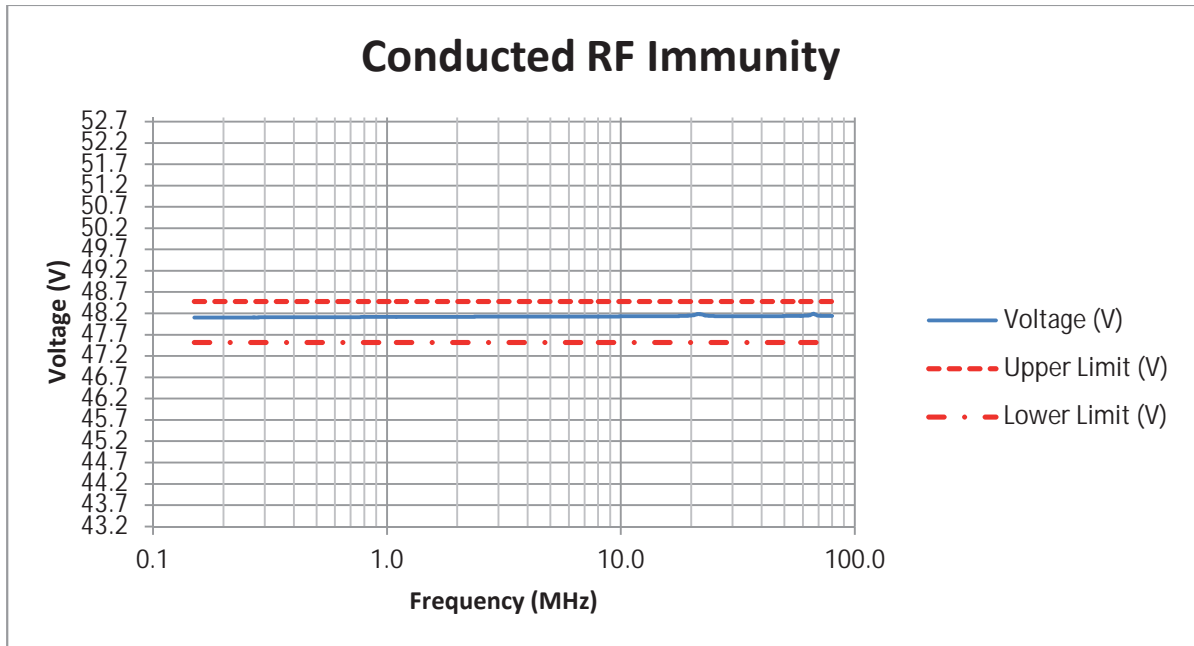
Test Equipment Settings:

| Frq. start [MHz] | Level start [V] | Frq. stop [MHz] | Level stop [V] | Frq. step | td [s] | tp [s] | Modulation |
|---------------------|--------------------|--------------------|-------------------|-----------|-----------|-----------|-------------|
| 0.150 | 10.0 | 80.000 | 10.0 | 1.0 % | 0.5 | 0.0 | AM 1kHz 80% |

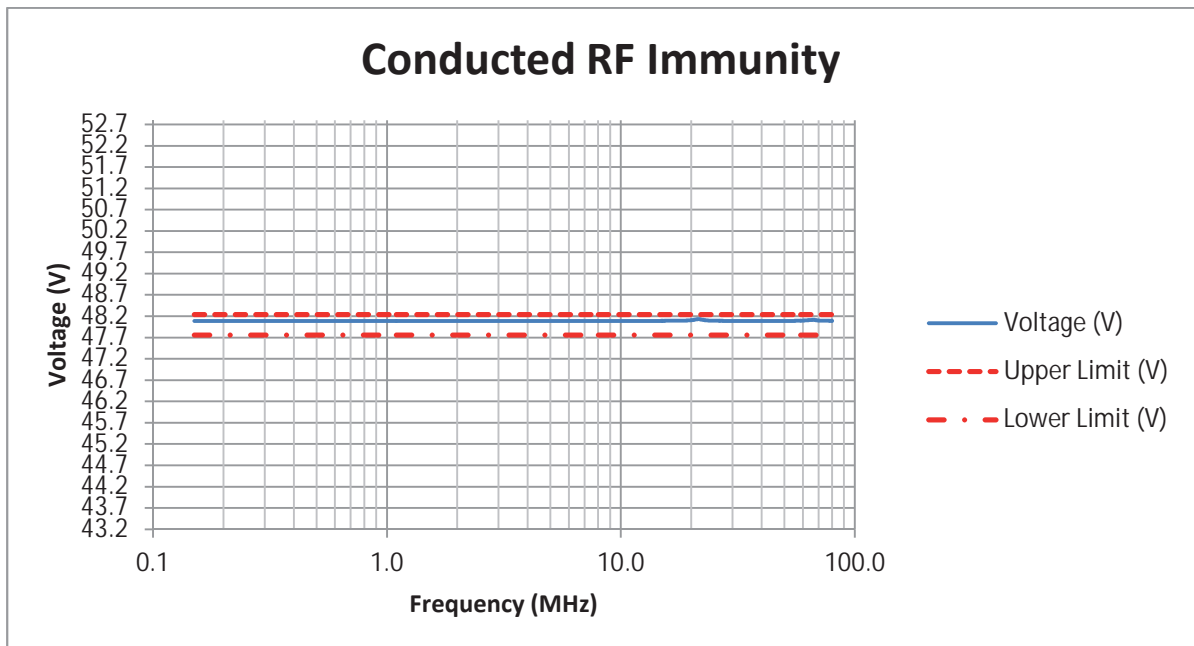
Test Setup:



7.2. Conducted RF Immunity Test Results



Conducted noise on L and N inputs.



Conducted noise on Earth Port (PE) input.

Conclusion:

The EUT meets performance criteria A, defined as $V_{out} > DC\ OK\ Limit$ (see specification) during the test, as required by EN50121-1: 2017 Section 3.

PASS

8. Conducted RF Immunity Test at DC Output Terminals

Equipment under Test: TIB 080-148
EUT Serial No.: 21802100034
Customer Spec: XXXPSX184
Date: 30/01/2018
Standard: EN50121-4: 2016 referring to IEC 61000-4-6:2004

Notes:

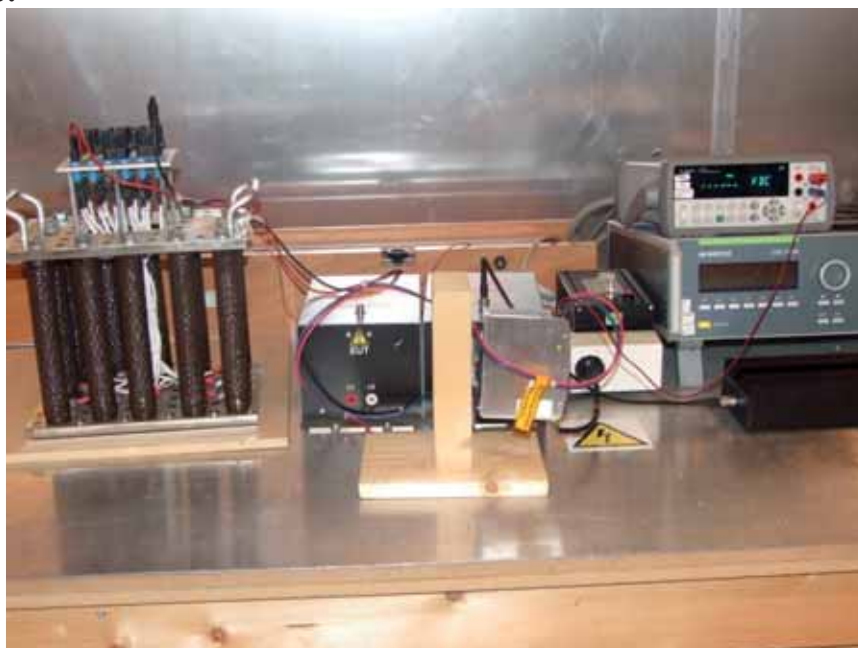
- This railway standard has the same requirements as IEC61000-6-2: 2005. The results below are extracted from the standard Traco Power EMC test report.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V/1.7A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75”, measurement instrument “Agilent 34410A” and FCC-801-M2-50A Coupling/Decoupling network.
- Unit tested to IEC61000-4-6 test level 3.

8.1. Test Setup:

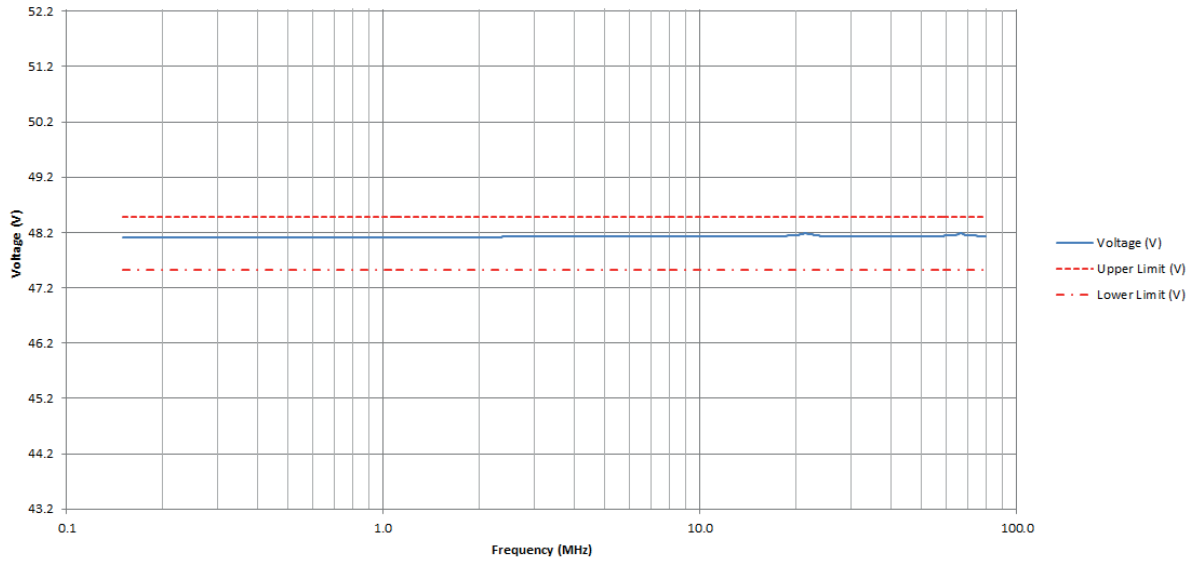
Test Equipment Settings:

| Frq. start [MHz] | Level start [V] | Frq. stop [MHz] | Level stop [V] | Frq. step | td [s] | tp [s] | Modulation |
|---------------------|--------------------|--------------------|-------------------|-----------|-----------|-----------|-------------|
| 0.150 | 10.0 | 80.000 | 10.0 | 1.0 % | 0.5 | 0.0 | AM 1kHz 80% |

Test Setup:



8.2. Conducted RF Immunity Test Results



Conclusion:

The EUT meets performance criteria A, defined as $V_{out} > DC\ OK\ Limit$ (see specification) during the test, as required by EN50121-1: 2017 Section 3.

PASS

9. Radiated RF Immunity Test

Equipment under Test: TIB 080-148
EUT Serial No.: 21835064794
Customer Spec: XXXPSX184
Date: 24/10/2018
Standard: EN50121-4: 2016 referring to IEC61000-4-3: 2004

Notes:

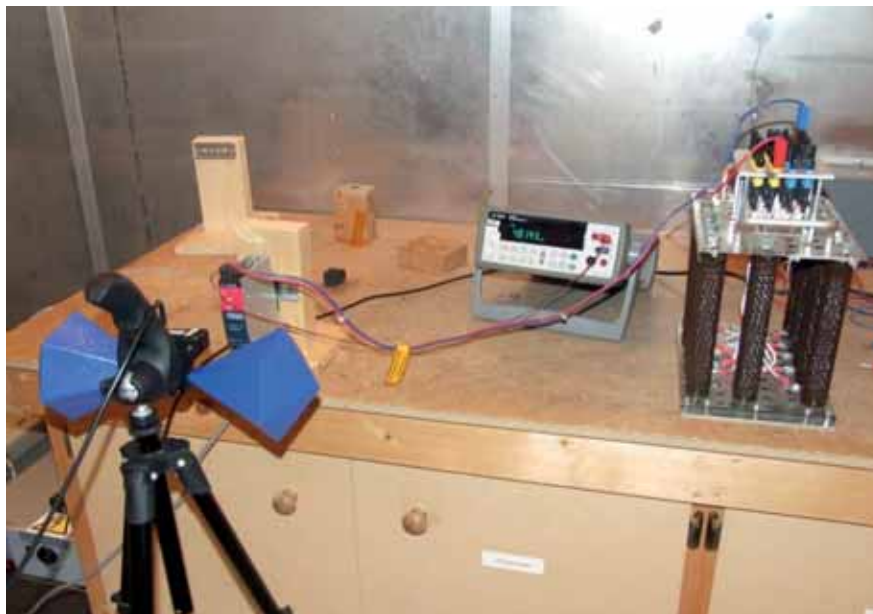
- This railway standard has the same requirements as IEC61000-6-2: 2005 up to 800MHz. The results below are extracted from the standard Traco Power EMC test report up to this frequency.
- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V, 1.7A Resistive).
- Test carried out using test generator “EM Test CWS 500N”, Antenna BicoLOG 30100 X and Digitizing Multi Meter “Agilent 34405A”
- Measurement was carried out in a shielded room
- The input power port of the EUT was connected to mains via a 1.5m 3-core cable
- The output power port of the EUT was connected to the resistor bank via 1.5m long single core wires –wire size 14AWG
- The frequency range 800MHz-6GHz cannot be tested (due to the lack of equipment).

9.1. Test Setup

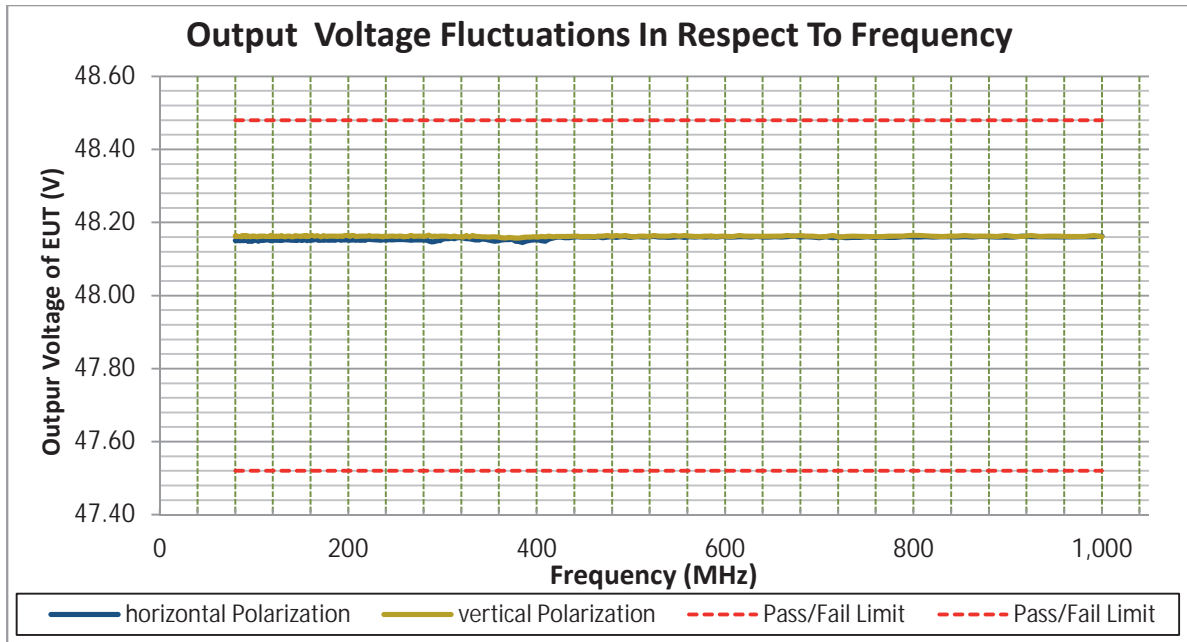
Test Equipment Settings:

| Frq. start [MHz] | Level start [V] | Frq. stop [MHz] | Level stop [V] | Frq. step | td [s] |
|------------------|-----------------|-----------------|----------------|-----------|--------|
| 80.0 | 10.0 | 1000.0 | 10.0 | 1.0 % | 1 |

Test Setup:



9.2. Radiated RF Immunity Test Results



Conclusion:

The EUT meets performance criteria A, defined as $V_{out} > DC\ OK\ Limit$ (see specification) during the test, as required by EN50121-1: 2017 Section 3.

PASS

10. Power Frequency Magnetic Field Immunity Test

Equipment under Test: TIB 080-148
EUT Serial No.: 21835064794
Customer Spec: XXXPSX184
Date: 31/10/2018
Standard: EN50121-4:2016 referring to IEC61000-4-8: 2001

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full nominal load (48V, 1.7A Resistive).
- Test carried out using test generator “Chroma Programmable AC Source”, “1meter x 1meter 100 turn Induction Coil” and measurement instrument “Agilent 34405A”.

10.1. Test Setup

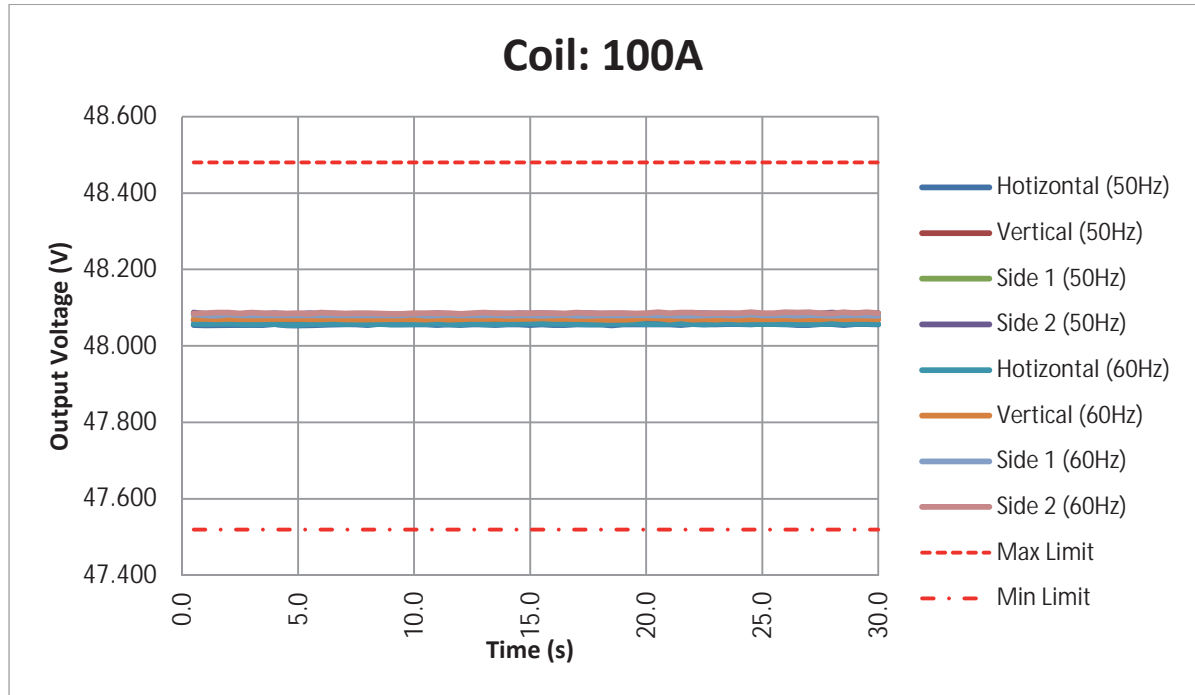
Test Equipment Settings:

| Test generator settings | | | |
|-------------------------|--|-------------------------------|----------------------------|
| Frequency | AC Current through Induction Coil (Arms) | Magnetic Field Strength (A/m) | Applied Field duration [s] |
| 0Hz | 1 | 100 | Continuous (>10s) |
| 16.66Hz | 1 | 100 | Continuous (>10s) |
| 50Hz | 1 | 100 | Continuous (>10s) |

Test Setup:



10.2. Power Frequency Magnetic Field Immunity Test Results



Conclusion:

The EUT meets performance criteria A, defined as $V_{out} > DC\ OK\ Limit$ (see specification) during the test, as required by EN50121-1: 2017 Section 3.

PASS

11. Summary EN 50121-4

| Regulation | Class/Test Level | Result | Comments |
|---|--|--------|--|
| EN50121-4:2014 + CISPR 16-1-2: 2003 + CISPR 16-2-3: 2003 | | | |
| Conducted Input (0.15-30MHz) | Class A | PASS | Passes Class B, automatic Pass Class A |
| Conducted Output (0.15-30MHz) | Class A with AC input limits | PASS | - |
| Radiated (30-300MHz) | Class A | | See Traco Power EMC - Test Report for Radiated Emission (Passes Class B, automatic Pass Class A) |
| IEC61000-6-3: 2011 + IEC 61000-3-2: 2005 | | | |
| Harmonic Current Emissions Measurement at Mains Terminal | Class A | PASS | |
| EN50121-4:2014 + IEC 61000-4-2:2005 | | | |
| Electrostatic Discharge | | | |
| - Air Discharge | +/- 2/8kV (Class B) | PASS | |
| - Contact Discharge | +/- 2/4/6kV (Class B) | PASS | |
| EN50121-4:2014 + IEC 61000-4-5:2005 | | | |
| Surge | | | |
| - AC Power Ports | +/- 1kV (Class B) Line to Line | PASS | |
| - AC Power Ports | +/- 2kV (Class B) Line to PE | PASS | |
| - DC Power Ports | +/- 1kV (Class B) Line to Line | | Not tested |
| - DC Power Ports | +/- 2kV (Class B) Line to PE | | Not tested |
| EN50121-4:2014 + IEC 61000-4-4: 2004 | | | |
| Fast Transient (Burst) | | | |
| - AC & DC Power Ports | +/- 2kV (Class A) between all lines and ground plane | PASS | Vout>DC OK Limit (see specification) during test |
| - Signal Ports | +/- 1kV (Class A) between all lines and ground plane | PASS | Vout>DC OK Limit (see specification) during test |
| - Earth Ports | +/- 1kV (Class A) between all lines and ground plane | PASS | Vout>DC OK Limit (see specification) during test |

| | | | |
|---|-------------------------|------|-----------------|
| EN50121-4:2014 + IEC61000-4-6:2004 | | | |
| Conducted Input RF Immunity | Level III 10V (Class A) | PASS | |
| Conducted Output RF Immunity | Level III 10V (Class A) | PASS | |
| Signal Ports RF Immunity | Level III 10V (Class A) | PASS | |
| Conducted Earth Port RF Immunity | Level III 10V (Class A) | PASS | |
| EN50121-4:2014 + IEC61000-4-3:2004 | | | |
| Radiated RF Immunity | | PASS | Limited testing |
| EN50121-4:2014 + IEC61000-4-8:2001 | | | |
| Power Frequency Magnetic Field Immunity | Level 4 (Class A) | PASS | |

12. EN 50121-3-2 Railway applications.

There are very little differences between the requirements of the standard EN 50121-3-2 and the standard EN 50121-4. To avoid repetition the EN 50121-3-2 testing is summarised below.

13. Summary EN 50121-3-2

| Regulation | Class/Test Level | Result | Comments |
|---|---|--------------|--|
| EN50121-3-2:2015 + CISPR 16-1-2: 2003 + CISPR 16-2-3: 2003 | | | |
| Conducted Input (0.15-30MHz) | EN 50121-3-2 Limits = Class A Limits + 20dBuV margin | PASS | Passes Class B, automatic Pass 50121-3-2 with relaxed limits |
| Conducted Output (0.15-30MHz) | EN 50121-3-2 Limits = EN 50121-4 Limits + 20dBuV margin | PASS | Passes EN 50121-4, automatic Pass 50121-3-2 with relaxed limits |
| Radiated (30-300MHz) | Class A | | See Traco Power EMC - Test Report for Radiated Emission (Passes Class B, automatic Pass Class A) |
| EN50121-3-2:2015 + IEC 61000-3-2: 2005, EN 61000-4-30 | | | |
| Harmonic Current Emissions Measurement at Mains Terminal | Class A THD < 8% | PASS FAIL | Meets Class A harmonic limits but THD >8% (13%) |
| EN50121-3-2:2015 + IEC 61000-4-2:2005 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Electrostatic Discharge | | | |
| - Air Discharge | +/- 2/8kV (Class B) | PASS | |
| - Contact Discharge | +/- 2/4/6kV (Class B) | PASS | |

| | | | |
|---|--|------|--|
| EN50121-3-2:2015 + IEC 61000-4-5:2005 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Surge | | | |
| - AC Power Ports | +/- 1kV (Class B) Line to Line | PASS | |
| - AC Power Ports | +/- 2kV (Class B) Line to PE | PASS | |
| - DC Power Ports | +/- 1kV (Class B) Line to Line | | Not tested |
| - DC Power Ports | +/- 2kV (Class B) Line to PE | | Not tested |
| EN50121-3-2:2015 + IEC 61000-4-4: 2004 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Fast Transient (Burst) | | | |
| - AC & DC Power Ports | +/- 2kV (Class A) between all lines and ground plane | PASS | Vout>DC OK Limit (see specification) during test |
| - Signal Ports | +/- 1kV (Class A) between all lines and ground plane | PASS | Vout>DC OK Limit (see specification) during test |
| EN50121-3-2:2015 + IEC61000-4-6:2004 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Conducted Input RF Immunity | Level III 10V (Class A) | PASS | |
| Conducted Output RF Immunity | Level III 10V (Class A) | PASS | |
| Signal Ports RF Immunity | Level III 10V (Class A) | PASS | |
| Conducted Earth Port RF Immunity | Level III 10V (Class A) | PASS | |
| EN50121-3-2:2015 + IEC61000-4-3:2004 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Radiated RF Immunity | | PASS | Limited testing |
| EN50121-3-2:2015 + IEC61000-4-8: 2001 | | | Passes EN 50121-4, also Passes EN 50121-3-2 |
| Power Frequency Magnetic Field Immunity | Level 4 (Class A) | PASS | |

14. List of Equipment Used

| Description | Model No. | Manufacturer | Serial No. |
|-----------------------------|----------------|-------------------|-----------------|
| EMC Analyzer | E7402A | Agilent | MY45119210 |
| LISN 1 | PMM L2-16 | PMM | 1230L00301 |
| LISN 2 | FCC-801-M2-50A | FCC | 3035 |
| LISN 3 | NSLK 8127 | Schwarzbeck | 8127683 |
| RF Current Probe | F-33-1 | FCC | 759 |
| Transient Limiter | 11947A | Agilent | 3107A03645 |
| Precision Power Meter | LMG95 | Zimmer | 10790709 |
| ESD Gun | SESD 200 | Schloder | 142261 |
| Surge Generator | PSURGE 4010 | Haefely | 583 334-63 |
| Burst generator | PEFT 4010 | Haefely | 080 981-08 |
| Coupling Capacitor | IP4A | Haefely | 171241 |
| Electronic Load | ELA 500 | Zentro-Elektrik | 63145803 |
| High Power Resistors | n/a | n/a | n/a |
| Multimeter | 34405A | Agilent | TW46290007 |
| Multimeter | 34405A | Agilent | TW46290015 |
| Multimeter | 34410A | Agilent | MY47012359 |
| Multimeter | 1906 | TTI | n/a |
| Coupling/Decoupling Network | CDN M2/M3 | EM Test | 1108-34 |
| Attenuator | ATT6/75 | EM Test | 1107-53 |
| Oscilloscope | TDS1002 | Tektronix | C016388 |
| Oscilloscope | TDS2014C | Tektronix | C010602 |
| Programmable AC Source | 61604 | Chroma | ABR000000672 |
| DC power supply | SM 7020 - D | Delta elektronika | 014604000011 |
| DC power supply | SM 7020 - D | Delta elektronika | 014604000024 |
| Pulse Generator | 33220A | AGILENT | MY44044002 |
| Cables | Type | Length | Comments |
| Mains Supply Cable | 3-wire | 1m | Unshielded |
| Mains Supply Cable | 3-wire | 1.5m | Unshielded |
| DC Lines Cable | 2-wire | 1m | Unshielded |
| DC Lines Cable | 2-wire | 1.5m | Unshielded |

| Revision History | | | |
|------------------|------------|------------------------------|--|
| Revision | Date | Name | Description |
| 1.0 | 24/10/2018 | Shaun Foley & Barry O'Reilly | |
| 1.1 | 15/03/2019 | Sarah Evans | Add reference for EX models and rev. history |
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