

# Test Report



(Declaration of Conformity)

for

Electromagnetic Compatibility

of

Product : **DC/DC Converter**

Trade Name : **TRACO POWER**

Model Number : TEQ 300-4812WIR; TEQ 300-4813WIR;  
TEQ 300-4815WIR; TEQ 300-4816WIR;  
TEQ 300-4818WIR; TEQ 300-7212WIR;  
TEQ 300-7213WIR; TEQ 300-7215WIR;  
TEQ 300-7216WIR; TEQ 300-7218WIR

Prepared for

**Traco Electronic AG**

Sihlbruggstrasse 111, 6340 Baar  
Switzerland

Prepared by

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**Remark:**

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The test result in this report is only subjected to the test sample.

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## Statement of Compliance

**Applicant:** Traco Electronic AG  
**Manufacturer:** Traco Electronic AG  
**Product:** DC/DC Converter  
**Model No.:** TEQ 300-4812WIR; TEQ 300-4813WIR; TEQ 300-4815WIR;  
 TEQ 300-4816WIR; TEQ 300-4818WIR; TEQ 300-7212WIR;  
 TEQ 300-7213WIR; TEQ 300-7215WIR; TEQ 300-7216WIR;  
 TEQ 300-7218WIR  
**Tested Power Supply:** DC 48 V; DC 110 V  
**Date of Final Test:** Aug. 17, 2016  
**Revision of Report:** Rev. 01

### Measurement Procedures and Standards Used :

Emission:

EN 55032: 2015

Immunity:

EN 55024: 2010+A1: 2015

IEC 61000-4-2: 2008

IEC 61000-4-3: 2006+A1: 2007+A2: 2010

IEC 61000-4-4: 2012

IEC 61000-4-5: 2014

IEC 61000-4-6: 2013

IEC 61000-4-8: 2009

IEC 61000-4-11: 2004

The measurement results in this test report were performed at Interocean EMC Technology Corp. the responsibility of measurement result is only subjected to the tested sample. This report shows the EUT is technically compliance with the above official standards. This report shall not be partial reproduced without written approval by Interocean EMC Technology Corporation.

Report Issued: 2016/10/03

Project Engineer: Evans Chang Approved: Roy Chiang  
 Evans Chang Roy Chiang

# 1 General Information

## 1.1 Description of Equipment Under Test

- Product** : DC/DC Converter
- Model Number** : TEQ 300-4812WIR; TEQ 300-4813WIR; TEQ 300-4815WIR;  
TEQ 300-4816WIR; TEQ 300-4818WIR; TEQ 300-7212WIR;  
TEQ 300-7213WIR; TEQ 300-7215WIR; TEQ 300-7216WIR;  
TEQ 300-7218WIR
- Applicant** : **Traco Electronic AG**  
Sihlbruggstrasse 111, 6340 Baar  
Switzerland
- Manufacturer** : **Traco Electronic AG**  
Sihlbruggstrasse 111, 6340 Baar  
Switzerland
- Power Supply** : Please refer to section 1.2
- Date of Test** : Jun. 06 ~ Aug. 17, 2016
- Additional Description** : 1) The test models are “**TEQ 300-4812WIR; TEQ 300-4818WIR; TEQ 300-7212WIR**” and included in this report.  
2) The differences for all models included in this report, the details please refer to section 1.2.  
3) For more detail specification about EUT, please refer to the user’s manual.

**1.2 Specifications Description**

Model Name	Input Range	Vin Nominal	Output Voltage	Output Current
	VDC		VDC	A
TEQ 300-4812WIR	18 ~ 75	48	12	25
TEQ 300-4813WIR	18 ~ 75	48	15	20
TEQ 300-4815WIR	18 ~ 75	48	24	12.5
TEQ 300-4816WIR	18 ~ 75	48	28	10.8
TEQ 300-4818WIR	18 ~ 75	48	48	6.3
TEQ 300-7212WIR	43 ~ 160	110	12	25
TEQ 300-7213WIR	43 ~ 160	110	15	20
TEQ 300-7215WIR	43 ~ 160	110	24	12.5
TEQ 300-7216WIR	43 ~ 160	110	28	10.8
TEQ 300-7218WIR	43 ~ 160	110	48	6.3

All models maybe followed by any alphanumeric character, "-" or blank for market purpose.

### 1.3 Details of Tested Supporting System

1.3.1 Load (Model No.: TEQ 300-4812WIR)

Full Load : 300 W (12 V, 25 A)

1.3.2 Load (Model No.: TEQ 300-4818WIR)

Full Load : 302.4 W (48 V, 6.3 A)

1.3.3 Load (Model No.: TEQ 300-7212WIR)

Full Load : 300 W (12 V, 25 A)

1.3.4 Test Cable

Power Cable : Non-shielded, Detachable, 1.8 m, w/o core

## 1.4 Test Facility

- Site Description** : Conducted 1 OATS 1 EMS Room
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Location** : No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA  
Designation No.: TW1020 (Test Firm Registration #: 651092)  
Designation No.: TW1113 (Test Firm Registration #: 959554)
  - Industry Canada (IC)  
OUR FILE: 46405-4437  
Registration No. (OATS 1): Site# 4437A-1  
Registration No. (OATS 3): Site# 4437A-3  
Registration No. (Chamber 3): Site# 4437A-5  
Registration No. (OATS 5): Site# 4437A-6
  - Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan  
Member No.: 1349  
Registration No. (Conducted Room): C-1094  
Registration No. (Conducted Room): T-1562  
Registration No. (OATS 1): R-1040; G-274
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.  
Accreditation No.:  
SL2-IN-E-0026 for CNS 13438 / CISPR 22  
SL2-IN-E-0026 for CNS 14757-2 / IEC 62040-2  
SL2-R1-E-0026 for CNS 13439 / CISPR 13  
SL2-R2-E-0026 for CNS 13439 / CISPR 13  
SL2-L1-E-0026 for CNS 14115 / CISPR 15
  - Taiwan Accreditation Foundation (TAF)  
Accreditation No.: 1113
  - Vehicle Safety Certification Center (VSCC)  
Approval No.: TW16-11
  - TÜV NORD  
Certificate No: TNTW0801R

**1.5 Measurement Uncertainty**

Item	Value
Conduction 1:	
Conducted Emission - AMN (9 kHz to 30 MHz)	2.98 dB
Conducted Emission - AAN (ISN-T4) (150 kHz to 30 MHz)	3.70 dB
Conducted Emission - AAN (ISN-T8) (150 kHz to 30 MHz)	3.70 dB
Conducted Emission - CP (9 kHz to 30 MHz)	3.06 dB
Conducted Emission - VP (9 kHz to 30 MHz)	2.42 dB
Radiated Emission - LAS (2 m Loop) (9 kHz to 30 MHz)	3.26 dB
Conduction 2:	
Disturbance Power (30 MHz to 300 MHz)	4.04 dB
OATS 1:	
Radiated Emission Test (30 MHz to 1 GHz)	4.84 dB
Radiated Emission Test (1 GHz to 6 GHz)	4.84 dB
OATS 3:	
Radiated Emission Test (30 MHz to 1 GHz)	4.70 dB
OATS 5:	
Radiated Emission Test (30 MHz to 1 GHz)	4.70 dB
Chamber 3:	
Radiated Emission Test (9 kHz to 30 MHz)	3.12 dB
Radiated Emission Test (30 MHz to 1 GHz)	4.86 dB
Radiated Emission Test (1 GHz to 6 GHz)	4.78 dB
Induced Current Density (20 kHz to 10 MHz)	1.82 dB
Conducted Immunity Room:	
Conducted Immunity Test / CDN-M2	1.30 dB
Conducted Immunity Test / CDN-M3	1.30 dB
Conducted Immunity Test / EM Clamp	3.16 dB

**1.6 Summary of Test Results**

1.6.1 Test program according EN 55032

Emission test equipment intended	
<input checked="" type="checkbox"/>	Class A
<input type="checkbox"/>	Class B

Report Clause	Phenomenon	Application	Reference Clause(s)	Reference Standard	Result
2	Power Line Conducted Emission	DC Mains Power Port	Annex A.3	CISPR 16-2-1	PASS
	Asymmetric Mode Conducted Emissions	Wired Network Ports	Annex A.3	CISPR 16-2-1	Not Applicable
	Asymmetric Mode Conducted Emissions	Optical Fibre Ports	Annex A.3	--	Not Applicable
	Asymmetric Mode Conducted Emissions	Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
	Asymmetric Mode Conducted Emissions	Antenna Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	TV Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	RF Modulator Output Ports	Annex A.3	--	Not Applicable
	Conducted Differential Voltage Emissions	FM Broadcast Receiver Tuner Ports	Annex A.3	--	Not Applicable
3	Radiated Emission (Below 1 GHz)	Enclosure Port	Annex A.2	CISPR 16-1-4	PASS
	Radiated Emission (Above 1 GHz)	Enclosure Port	Annex A.2	CISPR 16-1-4	Not Applicable <sup>a</sup>
	Radiated Emissions (FM Receivers)	Enclosure Port	Annex A.2	CISPR 16-1-4	Not Applicable

Note: <sup>a</sup> The highest frequency of the internal sources of the EUT is less than 108 MHz and therefore the measurement is not required.

1.6.2 Test program according EN 61000-3-2

Report Clause	Phenomenon	Application	Reference Clause	Reference Standard	Result
	Harmonic Current Emissions	AC Power Port	5	--	Not Applicable

1.6.3 Test program according EN 61000-3-3

Report Clause	Phenomenon	Application	Reference Clause	Reference Standard	Result
	Voltage Changes, Voltage Fluctuations and Flicker	AC Power Port	5	--	Not Applicable

## 1.6.4 Test program according EN 55024

<b>Report Clause</b>	<b>Phenomenon</b>	<b>Application</b>	<b>Reference Clause(s)</b>	<b>Reference Standard</b>	<b>Result</b>
5	Electrostatic Discharge (ESD)	Enclosure Port	4.2.1	IEC 61000-4-2	PASS
6	Radio-Frequency Electromagnetic Field	Enclosure Port	4.2.3.1	IEC 61000-4-3	PASS
7	Fast Transients	DC Power Port	4.2.2	IEC 61000-4-4	PASS
8	Surges	DC Power Port	4.2.5	IEC 61000-4-5	PASS
9	Radio-Frequency Continuous Conducted	DC Power Port	4.2.3.2	IEC 61000-4-6	PASS
10	Power-Frequency Magnetic Field	Enclosure Port	4.2.4	IEC 61000-4-8	PASS
	Voltage Dips and Interruptions	AC Power Port	4.2.6	IEC 61000-4-11	Not Applicable

## 1.7 Measured Mode

1.7.1 The test modes for preliminary test are as following:

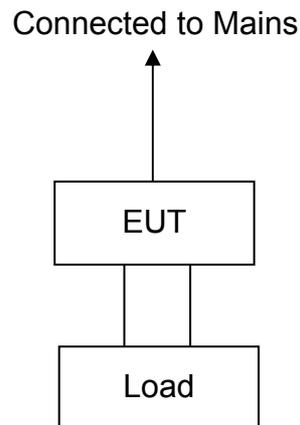
- Mode 1: Full Load (Model No.: TEQ 300-4812WIR)
- Mode 2: Full Load (Model No.: TEQ 300-4818WIR)
- Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

1.7.2 After preliminary test, EUT was selected the worst-case for the final testing.

The test modes are:

- For Emission: Mode 1 ~ 3
- For Immunity: Mode 3

## 1.8 Configuration of EUT Setup



## 1.9 Test Step of EUT

- 1.9.1 Setup the EUT and peripheral as above.
- 1.9.2 Turn on the power of all equipment.
- 1.9.3 Check the function is normal.
- 1.9.4 Executed the test.

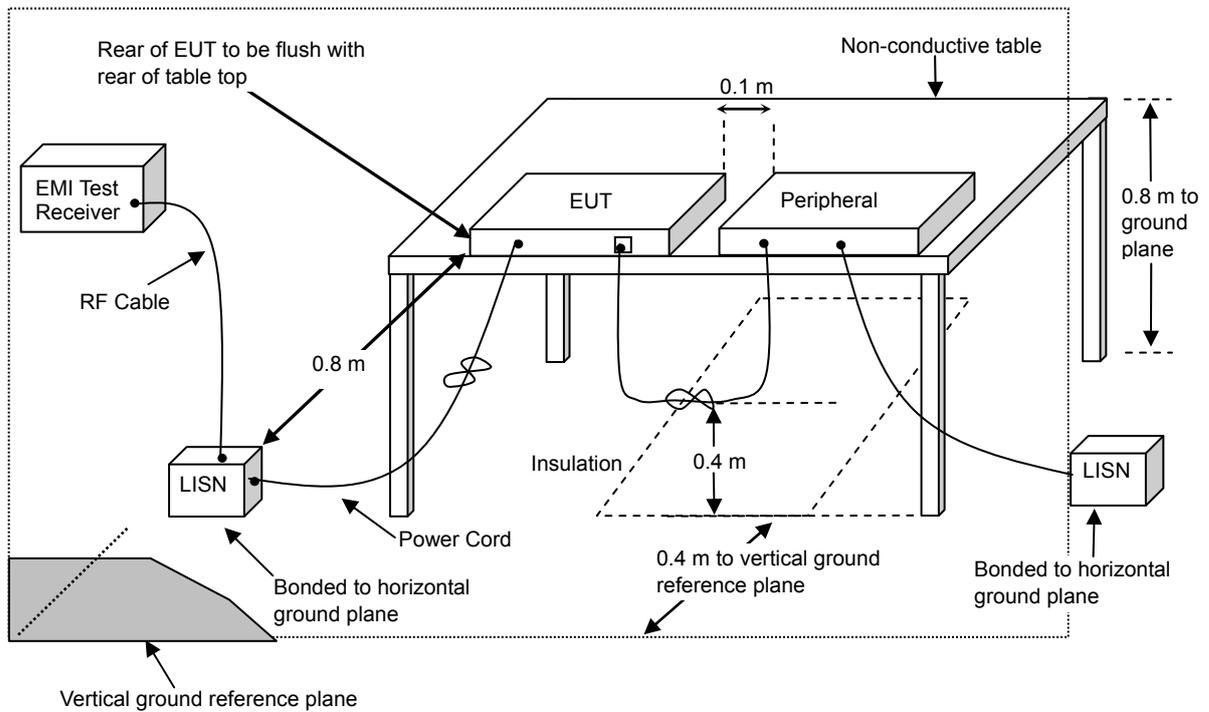
## 2 Power Line Conducted Emission

### 2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100127	2016/10/25
RF Cable	HARBOUR	RG58/U	CBL48	2016/07/27
L.I.S.N.	Schwarzbeck	NNLK8121	8121417	2017/03/20
L.I.S.N.	Schaffner	MN2050D	1598	2016/08/27
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

### 2.2 Block Diagram of Test Configuration



### 2.3 Conducted Limits

Frequency (MHz)	☒ Class A (dB $\mu$ V)		☐ Class B (dB $\mu$ V)	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 to 0.50	79	66	66 to 56	56 to 46
0.50 to 5.0	73	60	56	46
5.0 to 30	73	60	60	50

## 2.4 Instrument Configuration

- 2.4.1 Set the EMI test receiver frequency range from 150 kHz to 30 MHz.
- 2.4.2 Set the EMI test receiver bandwidth at 9 kHz.
- 2.4.3 Set the EMI test receiver detector as Quasi-Peak (Q.P.) and Average (AV).

## 2.5 Configuration of Measurement

- 2.5.1 The EUT was placed on a non-conductive table whose total height equaled 80 cm and vertical conducting plane located 40 cm to the rear of the EUT.
- 2.5.2 The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50 ohm / 50  $\mu$ H coupling impedance for the measuring equipment. The auxiliary equipment was also connected to the main power through a LISN that provided a 50 ohm/50  $\mu$ H coupling impedance with 50 ohm termination. (Refer to the block diagram of the test setup and photographs.)
- 2.5.3 The conducted disturbance was measured between the phase lead and the reference ground, and between the neutral lead and reference ground. The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 2.5.4 The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

## 2.6 Test Result

### **PASS.**

The final test data is shown as following pages.

Factor = Insertion Loss + Cable Loss

Level = Reading + Factor

Margin = Level - Limit

## Power Line Conducted Test Data

CLIENT: Traco Electronic AG

OPERATOR: Vic

EUT: DC/DC Converter

TEST SITE: Conducted 1

MODEL: TEQ 300-4812WIR

POLARIZATION: Line

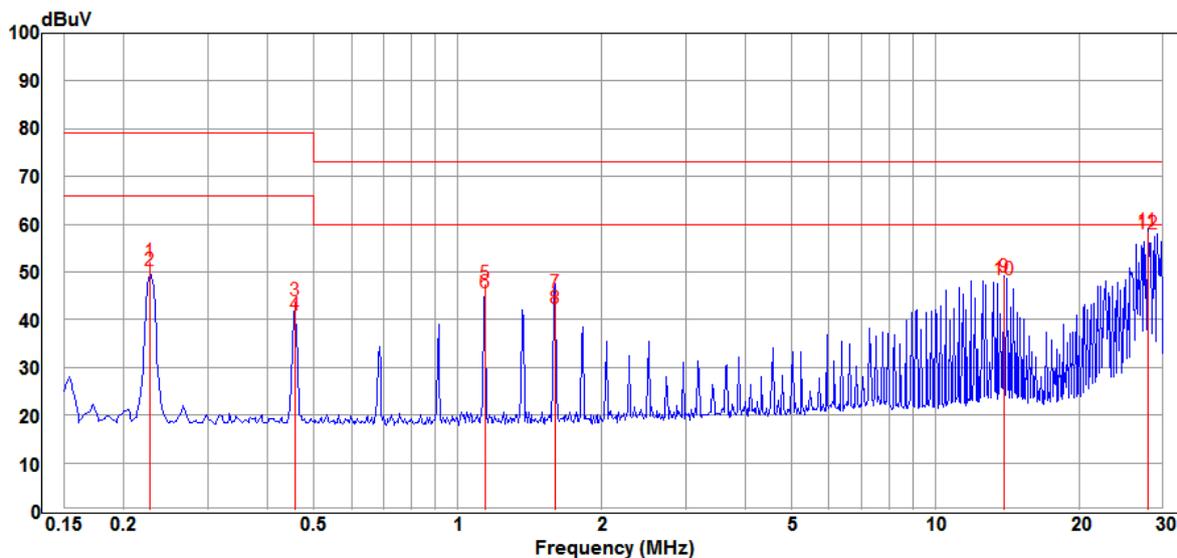
RATING: DC 48 V

TEMP/HUM: 27.4°C / 56%

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

Data:10

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	52.04	0.26	52.30	79.00	-26.70	QP
2	0.228	49.93	0.26	50.19	66.00	-15.81	Average
3	0.459	43.82	0.26	44.08	79.00	-34.92	QP
4	0.459	40.67	0.26	40.93	66.00	-25.07	Average
5	1.141	47.40	0.27	47.67	73.00	-25.33	QP
6	1.141	45.31	0.27	45.58	60.00	-14.42	Average
7	1.602	45.40	0.30	45.70	73.00	-27.30	QP
8	1.602	41.93	0.30	42.23	60.00	-17.77	Average
9	13.915	48.16	0.83	48.99	73.00	-24.01	QP
10	13.915	47.58	0.83	48.41	60.00	-11.59	Average
11	27.855	57.13	1.33	58.46	73.00	-14.54	QP
12	27.855	56.68	1.33	58.01	60.00	-1.99	Average

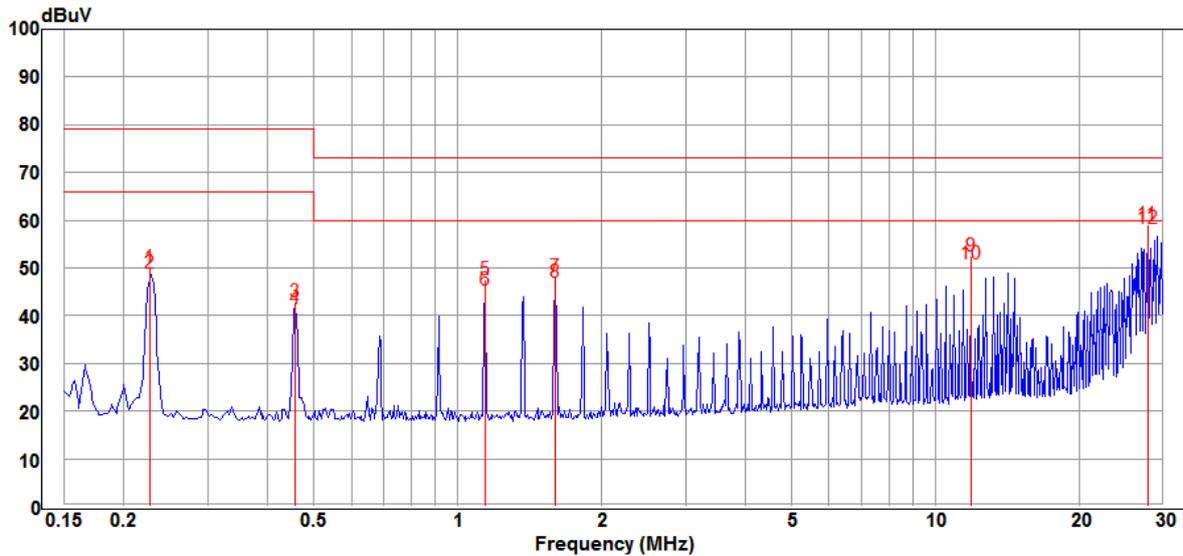
## Power Line Conducted Test Data

CLIENT: Traco Electronic AG  
 EUT: DC/DC Converter  
 MODEL: TEQ 300-4812WIR  
 RATING: DC 48 V  
 COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

OPERATOR: Vic  
 TEST SITE: Conducted 1  
 POLARIZATION: Neutral  
 TEMP/HUM: 27.4°C / 56%

Data:9

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	49.89	0.24	50.13	79.00	-28.87	QP
2	0.228	48.80	0.24	49.04	66.00	-16.96	Average
3	0.459	42.53	0.25	42.78	79.00	-36.22	QP
4	0.459	41.38	0.25	41.63	66.00	-24.37	Average
5	1.141	47.27	0.27	47.54	73.00	-25.46	QP
6	1.141	45.16	0.27	45.43	60.00	-14.57	Average
7	1.602	47.83	0.30	48.13	73.00	-24.87	QP
8	1.602	46.68	0.30	46.98	60.00	-13.02	Average
9	11.870	51.65	0.80	52.45	73.00	-20.55	QP
10	11.870	50.06	0.80	50.86	60.00	-9.14	Average
11	27.855	57.76	1.35	59.11	73.00	-13.89	QP
12	27.855	56.91	1.35	58.26	60.00	-1.74	Average

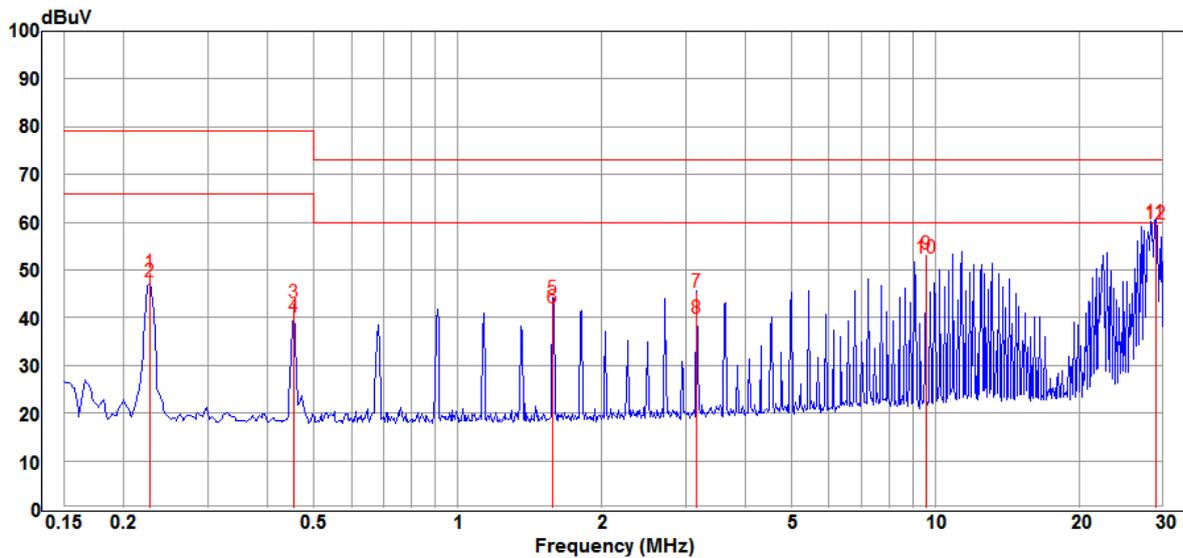
## Power Line Conducted Test Data

CLIENT: Traco Electronic AG  
 EUT: DC/DC Converter  
 MODEL: TEQ 300-4818WIR  
 RATING: DC 48 V  
 COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

OPERATOR: Vic  
 TEST SITE: Conducted 1  
 POLARIZATION: Line  
 TEMP/HUM: 27.4°C / 56%

Data:5

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	49.32	0.26	49.58	79.00	-29.42	QP
2	0.228	47.21	0.26	47.47	66.00	-18.53	Average
3	0.454	42.95	0.26	43.21	79.00	-35.79	QP
4	0.454	39.84	0.26	40.10	66.00	-25.90	Average
5	1.585	43.68	0.30	43.98	73.00	-29.02	QP
6	1.585	41.61	0.30	41.91	60.00	-18.09	Average
7	3.173	45.03	0.35	45.38	73.00	-27.62	QP
8	3.173	39.52	0.35	39.87	60.00	-20.13	Average
9	9.552	52.84	0.58	53.42	73.00	-19.58	QP
10	9.552	51.85	0.58	52.43	60.00	-7.57	Average
11	28.908	58.62	1.35	59.97	73.00	-13.03	QP
12	28.908	58.27	1.35	59.62	60.00	-0.38	Average

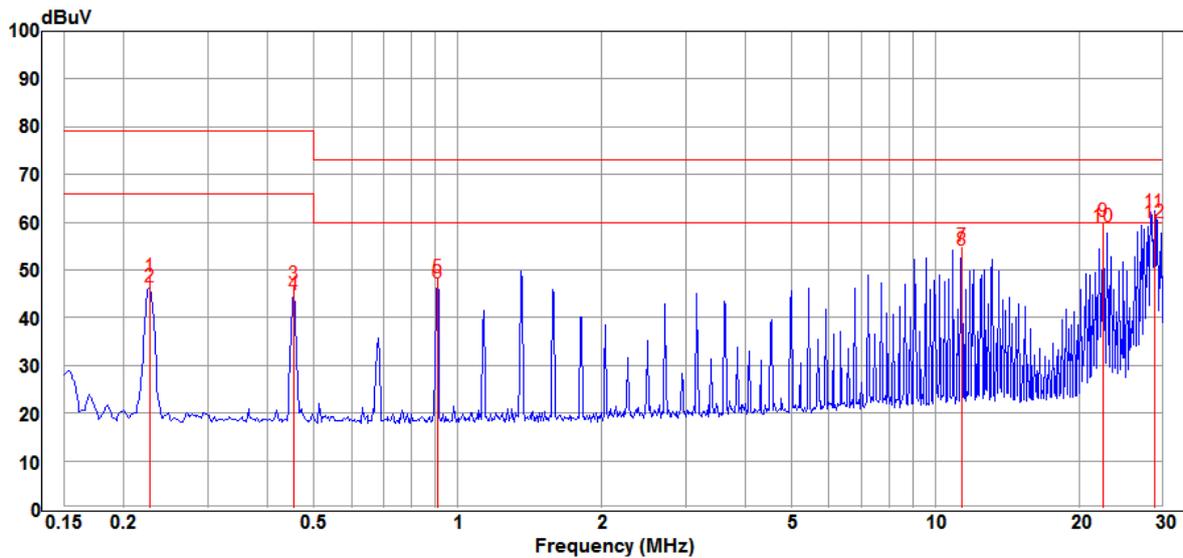
## Power Line Conducted Test Data

CLIENT: Traco Electronic AG  
 EUT: DC/DC Converter  
 MODEL: TEQ 300-4818WIR  
 RATING: DC 48 V  
 COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)

OPERATOR: Vic  
 TEST SITE: Conducted 1  
 POLARIZATION: Neutral  
 TEMP/HUM: 27.4°C / 56%

Data:6

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.228	48.30	0.24	48.54	79.00	-30.46	QP
2	0.228	46.21	0.24	46.45	66.00	-19.55	Average
3	0.454	46.74	0.25	46.99	79.00	-32.01	QP
4	0.454	44.63	0.25	44.88	66.00	-21.12	Average
5	0.909	48.24	0.26	48.50	73.00	-24.50	QP
6	0.909	47.11	0.26	47.37	60.00	-12.63	Average
7	11.377	54.23	0.76	54.99	73.00	-18.01	QP
8	11.377	53.48	0.76	54.24	60.00	-5.76	Average
9	22.416	58.89	1.21	60.10	73.00	-12.90	QP
10	22.416	57.77	1.21	58.98	60.00	-1.02	Average
11	28.755	60.85	1.37	62.22	73.00	-10.78	QP
12	28.755	58.56	1.37	59.93	60.00	-0.07	Average

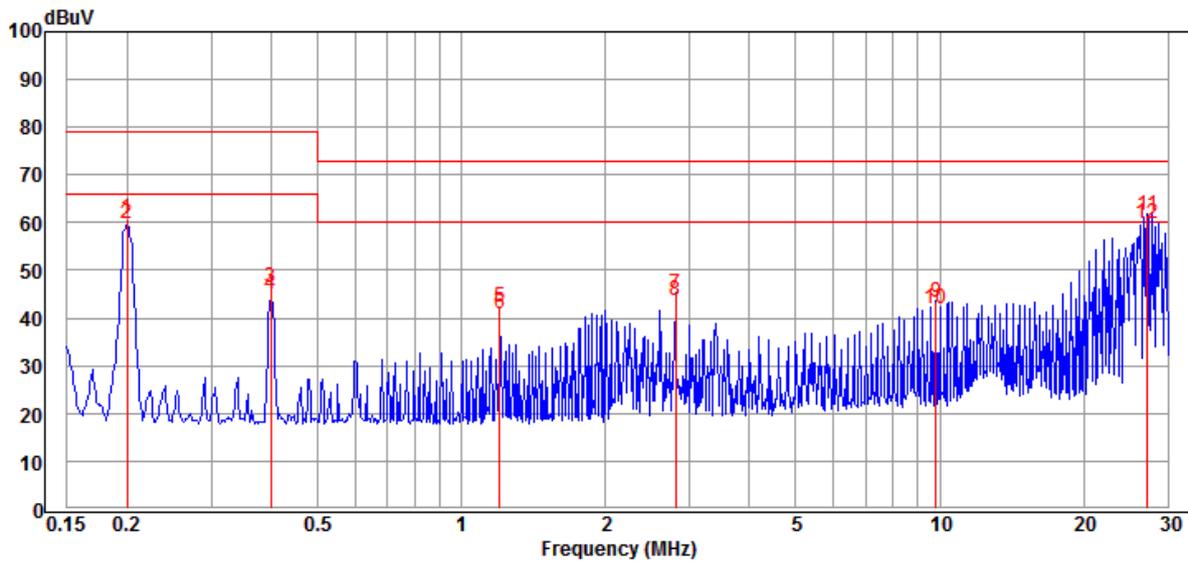
## Power Line Conducted Test Data

CLIENT: Traco Electronic AG  
 EUT: DC/DC Converter  
 MODEL: TEQ 300-7212WIR  
 RATING: DC 110 V  
 COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

OPERATOR: Vic  
 TEST SITE: Conducted 1  
 POLARIZATION: Line  
 TEMP/HUM: 27.4°C / 56%

Data:19

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.201	60.69	0.26	60.95	79.00	-18.05	QP
2	0.201	59.62	0.26	59.88	66.00	-6.12	Average
3	0.400	45.99	0.26	46.25	79.00	-32.75	QP
4	0.400	44.90	0.26	45.16	66.00	-20.84	Average
5	1.203	41.82	0.29	42.11	73.00	-30.89	QP
6	1.203	40.61	0.29	40.90	60.00	-19.10	Average
7	2.809	44.65	0.34	44.99	73.00	-28.01	QP
8	2.809	43.20	0.34	43.54	60.00	-16.46	Average
9	9.809	42.62	0.60	43.22	73.00	-29.78	QP
10	9.809	41.31	0.60	41.91	60.00	-18.09	Average
11	27.127	60.08	1.31	61.39	73.00	-11.61	QP
12	27.127	58.63	1.31	59.94	60.00	-0.06	Average

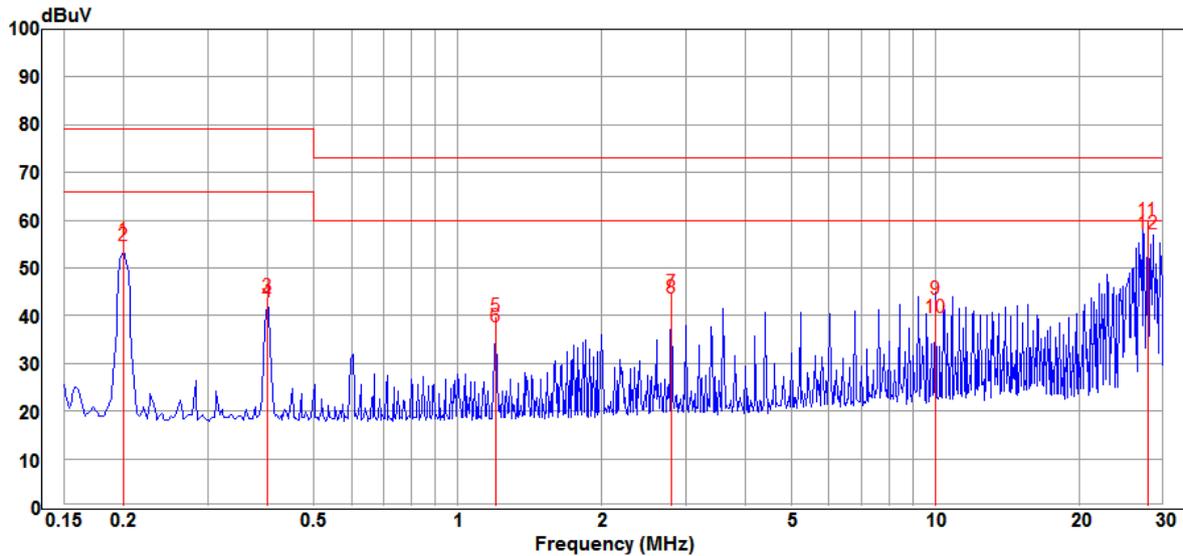
## Power Line Conducted Test Data

CLIENT: Traco Electronic AG  
 EUT: DC/DC Converter  
 MODEL: TEQ 300-7212WIR  
 RATING: DC 110 V  
 COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

OPERATOR: Vic  
 TEST SITE: Conducted 1  
 POLARIZATION: Neutral  
 TEMP/HUM: 27.4°C / 56%

Data:20

2016-06-06



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.201	55.66	0.24	55.90	79.00	-23.10	QP
2	0.201	54.53	0.24	54.77	66.00	-11.23	Average
3	0.400	43.73	0.25	43.98	79.00	-35.02	QP
4	0.400	42.56	0.25	42.81	66.00	-23.19	Average
5	1.203	39.45	0.28	39.73	73.00	-33.27	QP
6	1.203	37.30	0.28	37.58	60.00	-22.42	Average
7	2.809	44.33	0.34	44.67	73.00	-28.33	QP
8	2.809	43.26	0.34	43.60	60.00	-16.40	Average
9	10.019	42.71	0.63	43.34	73.00	-29.66	QP
10	10.019	38.82	0.63	39.45	60.00	-20.55	Average
11	27.855	58.57	1.35	59.92	73.00	-13.08	QP
12	27.855	55.82	1.35	57.17	60.00	-2.83	Average

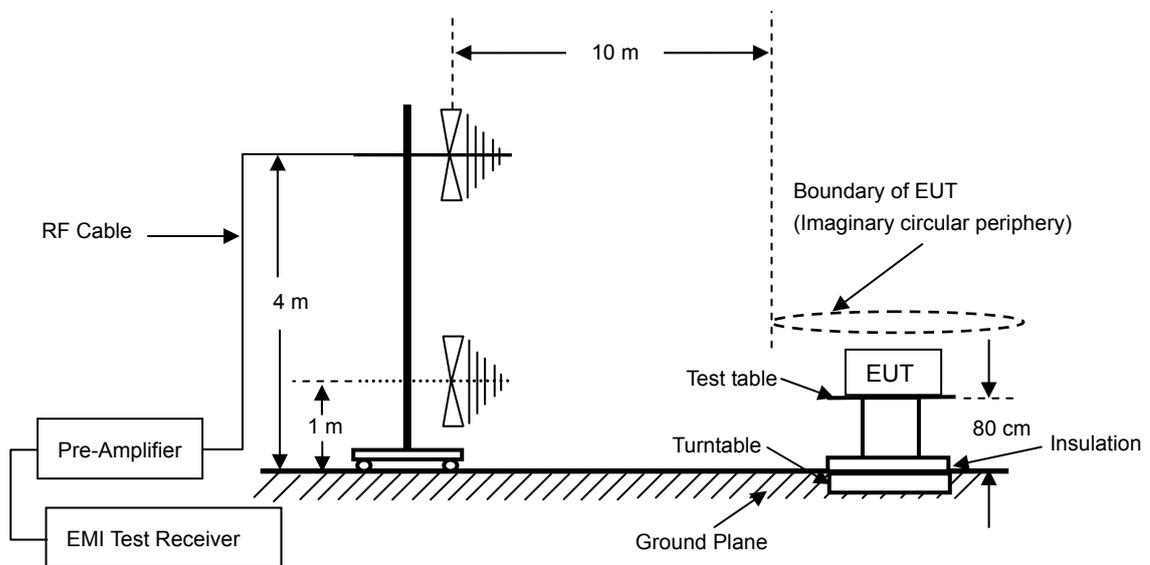
### 3 Radiated Emission (Below 1 GHz)

#### 3.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESVS10	826148/011	2016/10/07
Biconical Antenna	Schwarzbeck	VHA 9103 & BBA 9106	VHA 9103-2418	2017/07/13
Log Antenna	Schwarzbeck	UHALP 9108-A	9108-A 0739	2017/07/13
Pre-Amplifier	Agilent	8447D	2944A09703	2017/08/02
RF Cable	EMCI	EMC8D-NM-NM-25000	140105	2017/08/02
RF Cable	Mini-Circuits	CBL-3FL-NMNM	CBL56	2017/08/02
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

#### 3.2 Block Diagram of Test Configuration



#### 3.3 Radiated Limits

Frequency (MHz)	<input checked="" type="checkbox"/> Class A	<input type="checkbox"/> Class B
	Quasi-Peak dB(μV/m)	Quasi-Peak dB(μV/m)
30 to 230	40.0	30.0
230 to 1000	47.0	37.0

### 3.4 Instrument Configuration

- 3.4.1 Set the EMI test receiver frequency range from 30 MHz to 1000 MHz.
- 3.4.2 Set the EMI test receiver bandwidth at 120 kHz.
- 3.4.3 Set the EMI test receiver detector as Quasi-Peak (Q.P.).

### 3.5 Configuration of Measurement

- 3.5.1 The EUT was placed on a non-conductive table whose total height equaled 80 cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 3.5.2 The EUT was set 10 meters away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.
- 3.5.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 3.5.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

### 3.6 Test Result

**PASS.**

The final test data is shown as following pages.

Factor = Antenna Factor + Cable Loss - Preamplifier Gain

Level = Reading + Factor

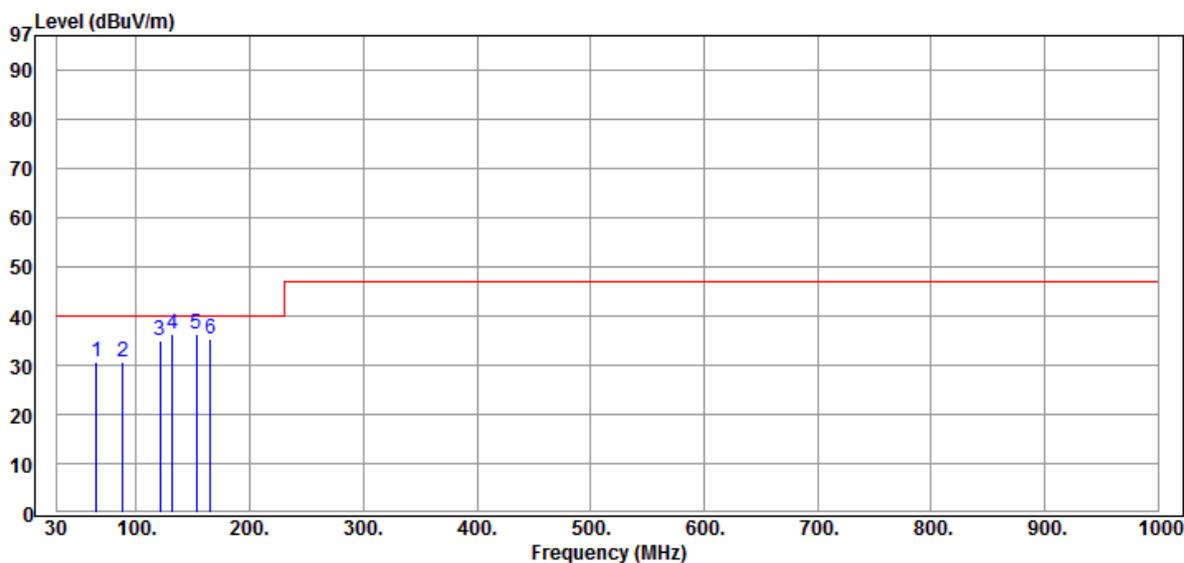
Margin = Level - Limit

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG	OPERATOR : Ceres
EUT: DC/DC Converter	TEST SITE : OATS 1
MODEL: TEQ 300-4812WIR	TEST DISTANCE : 10 m
RATING: DC 48 V	POLARIZATION : HORIZONTAL
COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)	TEMP/HUM : 26.6°C/42%

Data:29

2016-08-17



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	65.060	53.10	-22.54	30.56	40.00	-9.44	QP
2	87.960	53.21	-22.50	30.71	40.00	-9.29	QP
3	120.520	51.61	-16.48	35.13	40.00	-4.87	QP
4	131.520	52.11	-15.72	36.39	40.00	-3.61	QP
5	153.010	51.00	-14.65	36.35	40.00	-3.65	QP
6	165.010	48.90	-13.71	35.19	40.00	-4.81	QP

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG

OPERATOR : Ceres

EUT: DC/DC Converter

TEST SITE : OATS 1

MODEL: TEQ 300-4812WIR

TEST DISTANCE : 10 m

RATING: DC 48 V

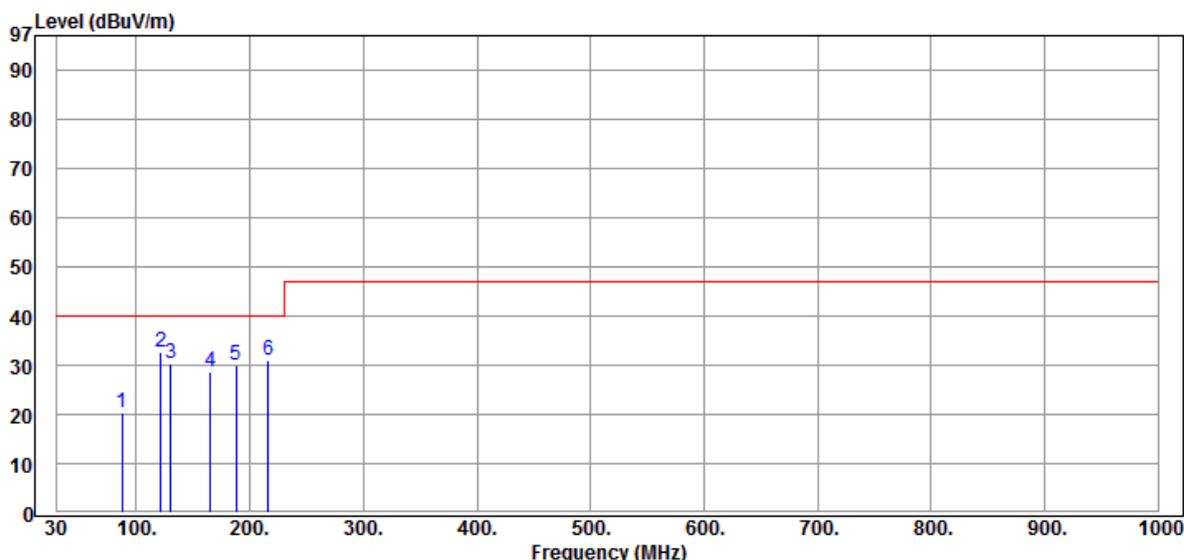
POLARIZATION : VERTICAL

COMMENT: Test Mode: Mode 1: Full Load (Model No.: TEQ 300-4812WIR)

TEMP/HUM : 26.6°C/42%

Data:30

2016-08-17



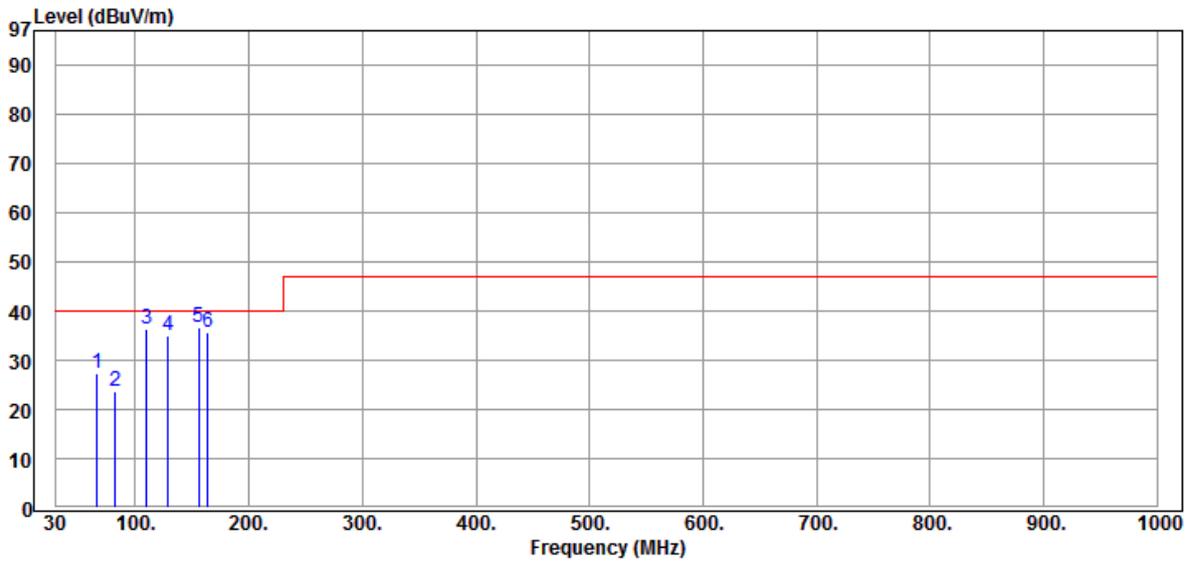
Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	87.060	42.99	-22.60	20.39	40.00	-19.61	QP
2	121.520	49.01	-16.40	32.61	40.00	-7.39	QP
3	130.320	46.11	-15.78	30.33	40.00	-9.67	QP
4	165.360	42.30	-13.68	28.62	40.00	-11.38	QP
5	187.960	43.10	-12.96	30.14	40.00	-9.86	QP
6	215.960	43.10	-12.21	30.89	40.00	-9.11	QP

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG	OPERATOR	: Ceres
EUT: DC/DC Converter	TEST SITE	: OATS 1
MODEL: TEQ 300-4818WIR	TEST DISTANCE	: 10 m
RATING: DC 48 V	POLARIZATION	: HORIZONTAL
COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)	TEMP/HUM	: 26.6°C/42%

Data:32

2016-08-17



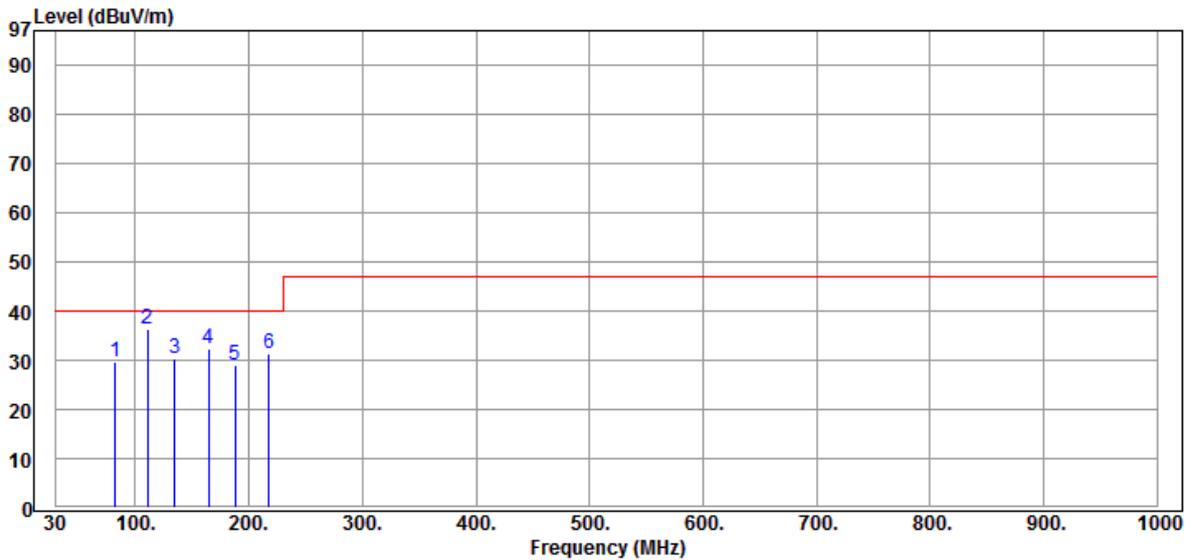
Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	65.960	50.01	-22.67	27.34	40.00	-12.66	QP
2	82.540	46.90	-23.22	23.68	40.00	-16.32	QP
3	109.870	54.00	-17.74	36.26	40.00	-3.74	QP
4	128.960	51.01	-15.87	35.14	40.00	-4.86	QP
5	155.870	51.00	-14.48	36.52	40.00	-3.48	QP
6	163.650	49.40	-13.86	35.54	40.00	-4.46	QP

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG	OPERATOR	: Ceres
EUT: DC/DC Converter	TEST SITE	: OATS 1
MODEL: TEQ 300-4818WIR	TEST DISTANCE	: 10 m
RATING: DC 48 V	POLARIZATION	: VERTICAL
COMMENT: Test Mode: Mode 2: Full Load (Model No.: TEQ 300-4818WIR)	TEMP/HUM	: 26.6°C/42%

Data:31

2016-08-17



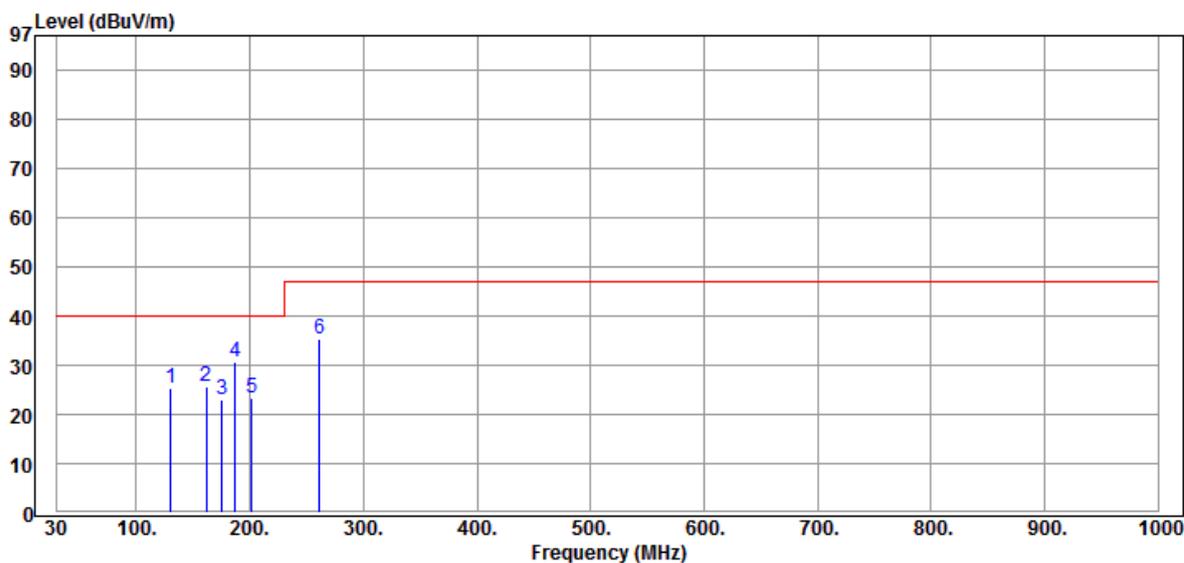
Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	81.960	53.10	-23.30	29.80	40.00	-10.20	QP
2	110.650	53.90	-17.64	36.26	40.00	-3.74	QP
3	134.850	46.00	-15.55	30.45	40.00	-9.55	QP
4	164.520	46.10	-13.77	32.33	40.00	-7.67	QP
5	187.960	42.10	-12.96	29.14	40.00	-10.86	QP
6	217.960	43.59	-12.16	31.43	40.00	-8.57	QP

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG	OPERATOR	: Ceres
EUT: DC/DC Converter	TEST SITE	: OATS 1
MODEL: TEQ 300-7212WIR	TEST DISTANCE	: 10 m
RATING: DC 110 V	POLARIZATION	: HORIZONTAL
COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)	TEMP/HUM	: 26.6°C/42%

Data:34

2016-08-17



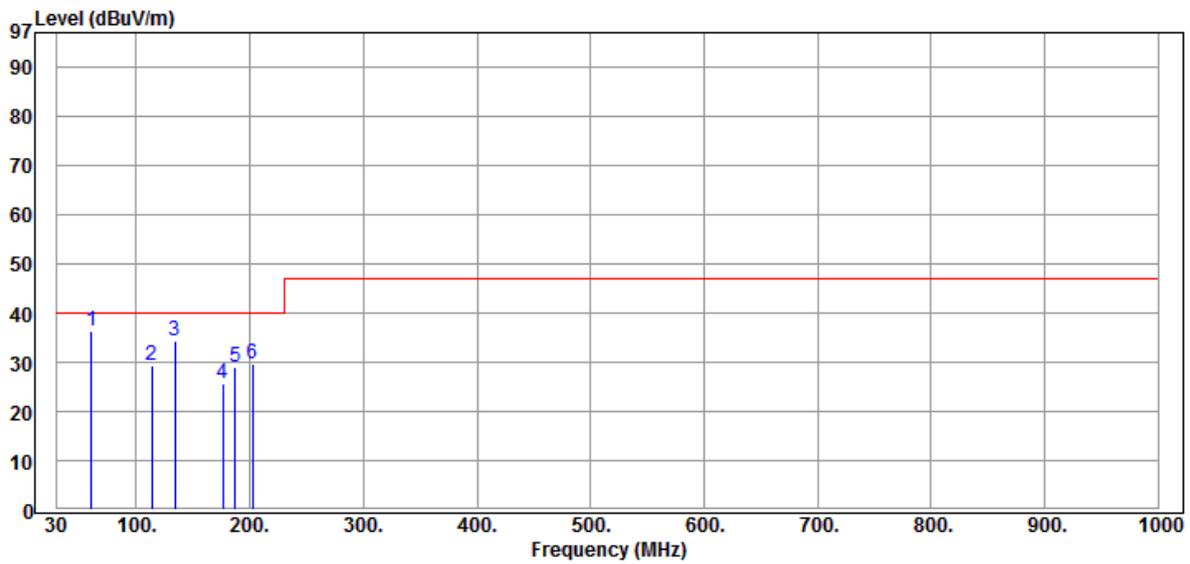
Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	130.650	41.19	-15.75	25.44	40.00	-14.56	QP
2	161.520	39.80	-14.08	25.72	40.00	-14.28	QP
3	175.140	36.10	-13.13	22.97	40.00	-17.03	QP
4	186.960	43.60	-12.97	30.63	40.00	-9.37	QP
5	201.650	35.90	-12.63	23.27	40.00	-16.73	QP
6	261.540	46.09	-10.81	35.28	47.00	-11.72	QP

## Radiated Emission Measurement Data

CLIENT: Traco Electronic AG	OPERATOR	: Ceres
EUT: DC/DC Converter	TEST SITE	: OATS 1
MODEL: TEQ 300-7212WIR	TEST DISTANCE	: 10 m
RATING: DC 110 V	POLARIZATION	: VERTICAL
COMMENT: Test Mode: Mode 3: Full Load (Model No.: TEQ 300-7212WIR)	TEMP/HUM	: 26.6°C/42%

Data:33

2016-08-17



Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	60.540	58.31	-21.94	36.37	40.00	-3.63	QP
2	113.630	46.50	-17.28	29.22	40.00	-10.78	QP
3	133.650	49.99	-15.60	34.39	40.00	-5.61	QP
4	175.850	38.89	-13.11	25.78	40.00	-14.22	QP
5	186.960	41.90	-12.97	28.93	40.00	-11.07	QP
6	202.300	42.41	-12.62	29.79	40.00	-10.21	QP

## 4 Performance Criterion of Immunity Test

### 4.1 EN 55024

<b>General performance criteria</b>	
<b>Criterion</b>	<b>Description</b>
A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
B	After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
C	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions.

### **Particular performance criteria**

The particular performance criteria which are specified in the normative annexes B~H take precedence over the corresponding parts of the general performance criteria.

Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

Annex B Data processing equipment:

(Read, write and storage of data; Data display; Data input; Data printing; Data processing)

Annex C Local area networks (LAN)

Annex D Printers and plotters

Annex E Copying machines

Annex F Automatic teller machines (ATM)

Annex G Point of sale terminals (POST)

Annex H xDSL Terminal equipment



**5.4 Configuration of Measurement**

5.4.1 Static electricity discharges shall be applied only to those points and surfaces of the EUT which are expected to be touched during usual operation, including user access, as specified in the user manual, for example for ribbon and paper roll changes.

5.4.2 The discharges shall be applied in two ways:

- a) Contact discharges to the conductive surfaces and to coupling planes:  
 The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points shall be subjected to at least 50 indirect discharges (contact) to the center of the front edge of the horizontal coupling plane (HCP), the remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode (see IEC 61000-4-2 for use of the Vertical Conducting Plane (VCP)). Tests shall be performed at a maximum repetition rate of one discharge per second.
- b) Air discharge at slots and apertures, and insulating surfaces:  
 On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur; examples are openings at edges of keys, or in the covers of keyboards and telephone handsets. Such points are tested using the air discharge method. See also IEC 61000-4-2 regarding painted surfaces. This investigation should be restricted to those areas normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

5.4.3 The ESD generator (gun) was held perpendicular to the surface to which the discharge was applied. The application of electrostatic discharges to the contacts of open connectors is not required.

**5.5 Test Result**

**PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Evans

**Mode 3: Full Load (Model No.: TEQ 300-7212WIR)**

- Air discharge ± 2 kV, ± 4 kV, ± 8 kV:             A     B     C
- Contact discharge ± 2 kV, ± 4 kV, ± 6 kV:         A     B     C
- Indirect discharge (HCP) ± 2 kV, ± 4 kV, ± 6 kV:  A     B     C
- Indirect discharge (VCP) ± 2 kV, ± 4 kV, ± 6 kV:  A     B     C

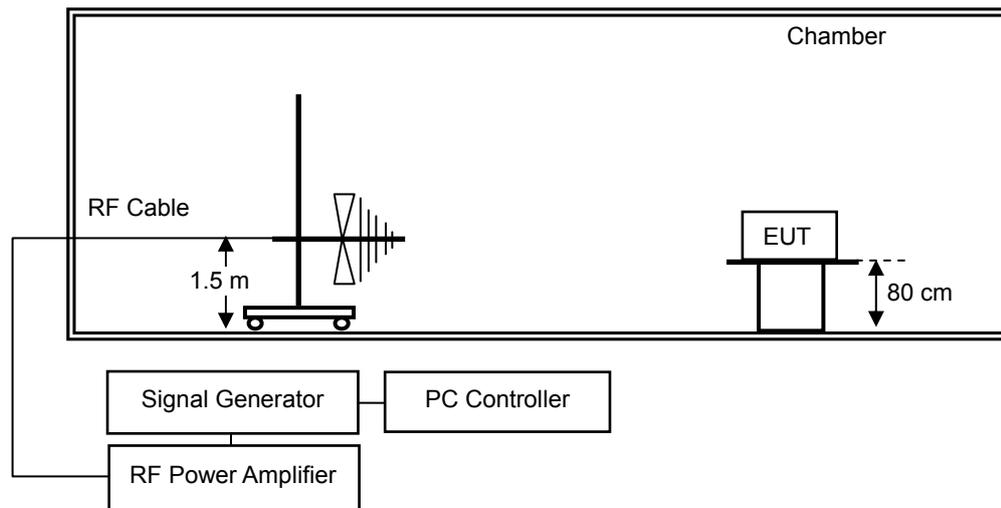
## 6 Radio- Frequency, Electromagnetic Field Immunity Test (IEC 61000-4-3)

### 6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	KEYSIGHT	N5171B	MY53051802	2017/03/09
Power Amplifier	R&K	A080M102-5555R	B30850	2017/04/28
Log Antenna	Schwarzbeck	VULP 9118 G Special	9118GS912	2017/04/28

Note: The above equipments are within the valid calibration period.

### 6.2 Block Diagram of Test Configuration



### 6.3 Test Requirement

IEC 61000-4-3 (EN 55024) require:

The frequency steps: 1 %, Log sweep, Dwell time: 3.0 sec.

Frequency range: **80 to 1000** MHz, Field strength: **3** V/m, 80 %AM (1 kHz),  
Performance criterion: **A**

### 6.4 Configuration of Measurement

- 6.4.1 Before testing, the intensity of the established field strength was checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward and reverse power were measured. The forward power needed to give the calibrated field was evaluated.
- 6.4.2 The EUT was placed on a non-metallic table 0.8 m above the reference ground plane (RGP) and was operated according to its specified operating mode.
- 6.4.3 Ferrite tiles/ absorbers were placed on the RGP between the EUT and the antenna to reduce the reflections from the RGP.
- 6.4.4 The distance between antenna and EUT is 1 meter.
- 6.4.5 During the test EUT performance has been monitoring by CCD camera.

**6.5 Test Result****PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Mark

**Mode 3: Full Load (Model No.: TEQ 300-7212WIR)** Frequency range: 80 to 1000 MHz, Field strength: 20 V/m, 80 % AM (1 kHz),Performance criterion:  A  B  C

## 7 Electrical Fast Transient/Burst Immunity Test (IEC 61000-4-4)

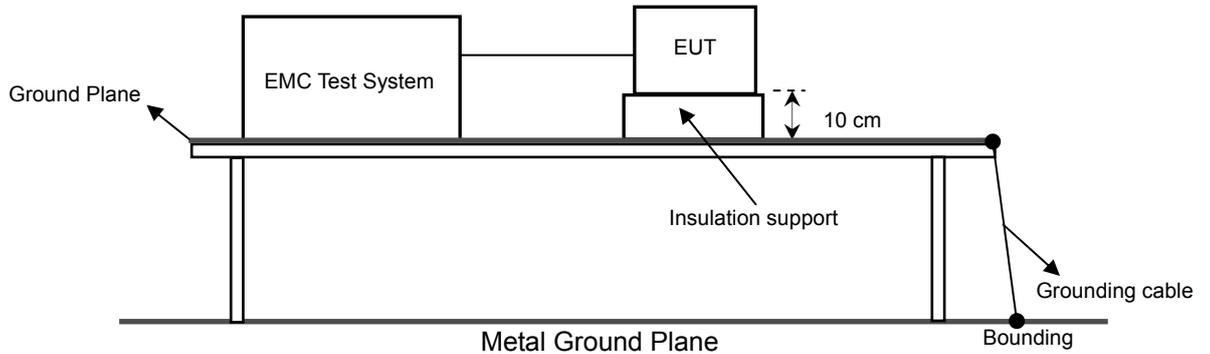
### 7.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Test System	EMC PARTNER	TRANSIENT-2000	812	2017/03/06

Note: The above equipments are within the valid calibration period.

### 7.2 Block Diagram of Test Configuration

For Power Ports.



### 7.3 Test Requirement

IEC 61000-4-4 (EN 55024) require:

5 kHz Repetition frequency

± 1.0 kV input AC power ports.

± 0.5 kV input DC power ports.

± 0.5 kV Signal ports.

± 0.5 kV for Telecommunication ports.

Performance criterion: **B**

### 7.4 Configuration of Measurement

7.4.1 The EUT and the auxiliary equipment were placed on a wooden table of 0.8 meters height. The size of ground plane is greater than 1 m×1 m and project beyond the EUT by at least 0.1 m on all sides. The ground plane is connected to the protective earth.

7.4.2 The EUT was connected to the power mains through a coupling device that directly couples the EFT interference signal. Each of the Line, Neutral and Protective Earth (PE) conductors was impressed with burst noise for 1 minute. Both the voltage polarities were applied for each test level. The length of power cord between the coupling device and the EUT was less than 1 meter.

## 7.5 Test Result

**PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Evans

### Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

- ± 2.0 kV input DC power port: Line  
Performance criterion:  A  B  C
- ± 2.0 kV input DC power port: Neutral  
Performance criterion:  A  B  C
- ± 2.0 kV input DC power port: Line + Neutral  
Performance criterion:  A  B  C

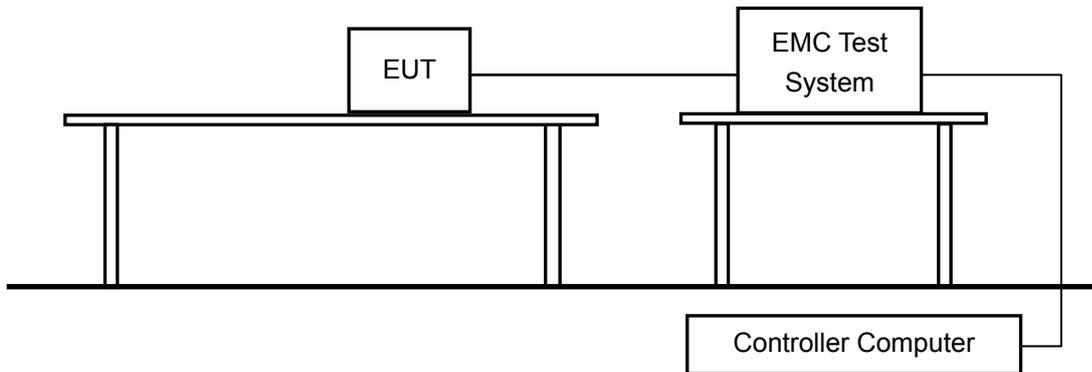
## 8 Surge Immunity Test (IEC 61000-4-5)

### 8.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMC Pro Systems	KeyTek	EMC Pro	0003234	2017/02/26

Note: The above equipments are within the valid calibration period.

### 8.2 Block Diagram of Test Configuration



### 8.3 Test Requirement

IEC 61000-4-5 (EN 55024) require:

- Input AC power ports:
  - Line to line:  $\pm 1.0$  kV (peak), 1.2/50 (8/20) Tr/Th  $\mu$ s
  - Line to earth (ground):  $\pm 2.0$  kV (peak), 1.2/50 (8/20) Tr/Th  $\mu$ s

Input DC power ports:  $\pm 0.5$  kV (peak): Line to earth, 1.2/50 (8/20) Tr/Th  $\mu$ s

Performance criterion: **B**

- Signal ports:
  - without primary protections:  $\pm 1.0$  kV (peak): 10/700 Tr/Th  $\mu$ s
  - Primary protectors:  $\pm 4.0$  kV (peak): 10/700 Tr/Th  $\mu$ s

- Telecommunication ports:
  - without primary protections:  $\pm 1.0$  kV (peak): 10/700 Tr/Th  $\mu$ s
  - Primary protectors:  $\pm 4.0$  kV (peak): 10/700 Tr/Th  $\mu$ s

Performance criterion: **C**

According to special request by client

- Input DC power ports:  $\pm 1.0$  kV (peak): Line to line, 1.2/50 (8/20) Tr/Th  $\mu$ s

Performance criterion: **A**

### 8.4 Configuration of Measurement

- 8.4.1 The EUT and support units were located on a wooden table 0.8 m away from ground floor.
- 8.4.2 The EUT was connected to the power mains through a coupling device that directly couples the Surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- 8.4.3 The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

## 8.5 Test Result

**PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Evans

### Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

- ± 0.5 kV (peak) Input DC power port: Line to line  
Performance criterion:  A  B  C
- ± 1.0 kV (peak) Input DC power port: Line to line  
Performance criterion:  A  B  C
- ± 0.5 kV (peak) Input DC power port: Line to earth  
Performance criterion:  A  B  C
- ± 1.0 kV (peak) Input DC power port: Line to earth  
Performance criterion:  A  B  C

## 9 Radio- Frequency, Conducted Disturbances Immunity Test (IEC 61000-4-6)

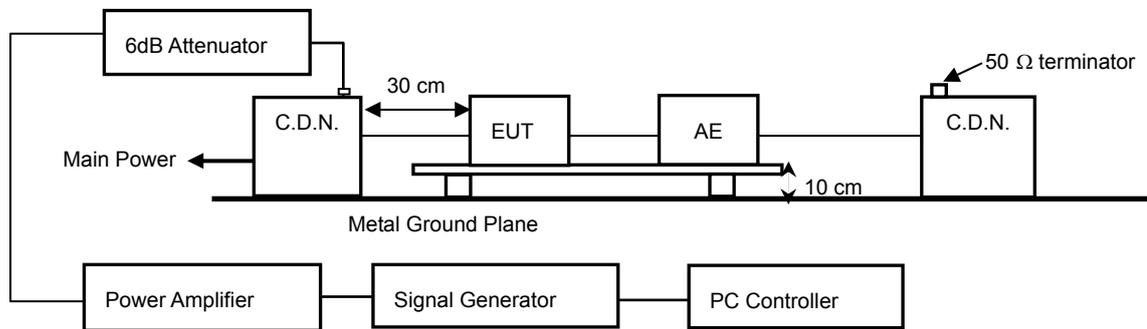
### 9.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Signal Generator	Marconi Instruments	2024	112246/087	2017/04/21
RF Power Amplifier	R&K	A009K101-5050R	B30850	2017/02/05
Attenuator	Microwave Device Inc.	MA-5250/6N	001052	2017/02/05
C.D.N	FCC	FCC-801-M3-25A	2045	2017/02/05
C.D.N	SCHAFFNER	M216	16394	2017/02/05

Note: The above equipments are within the valid calibration period.

### 9.2 Block Diagram of Test Configuration

For Power Ports.



### 9.3 Test Requirement

IEC 61000-4-6 (EN 55024) require:

The frequency steps: 1 %, Log sweep, Dwell time: 3.0 sec.

Frequency Range is from 0.15 to 80 MHz.

Field strength: 3 V, 80 % AM (1 kHz)

- Input AC power ports.
- Input DC power ports.
- Signal ports.
- Telecommunication ports.

Performance criterion: **A**

## 9.4 Configuration of Measurement

- 9.4.1 The EUT was placed on a table of is 0.1 m height. In Semi-Anechoic chamber A Ground reference plane was placed on the table and a 0.1 meter insulating support was inserted between the EUT and Ground reference plane.
- 9.4.2 The EUT was connected to the power mains through a Coupling and Decoupling Networks (CDN).
- 9.4.3 The test was performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF input ports of the coupling devices were terminated by a 50  $\Omega$  terminator.
- 9.4.4 The frequency range was swept from 150 kHz to 80 MHz.using the signal levels established during the setting process, and without the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to switch coupling devices as necessary. The rate of sweep was less than  $1.5 \times 10^{-3}$  decades/s. And the step size of the frequency sweep was also less than 1 % of the start and thereafter 1 % of the preceding frequency value. The dwell time at each frequency was more than the time necessary for the EUT to be excited, and able to respond.
- 9.4.5 The EUT was fully excised during the testing and all the selected excise modes were fully interrogated for susceptibility.

## 9.5 Test Result

**PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Evans

### Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Frequency range: 0.15 to 80 MHz, Field strength: 10 V, 80 % AM (1 kHz),

Input DC power port.

Performance criterion:  A  B  C

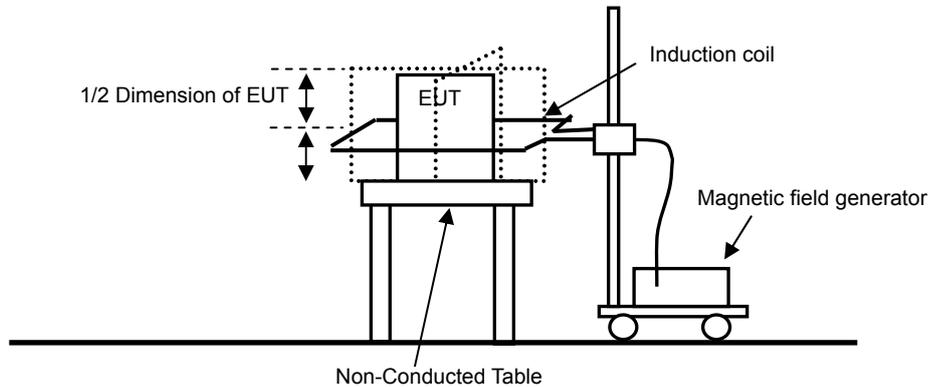
## 10 Power Frequency Magnetic Field Immunity Test (IEC 61000-4-8)

### 10.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Magnetic field generator	PMM	PMM1008	0000J00301	2016/06/21

Note: The above equipments are within the valid calibration period.

### 10.2 Block Diagram of Test Configuration



### 10.3 Test Requirement

IEC 61000-4-8 (EN 55024) require:

Power Frequency is **50** Hz.

Magnetic field strength: **1** A/m

Performance criterion: **A**

### 10.4 Configuration of Measurement

10.4.1 The equipment is configured and connected to satisfy its functional requirements.

10.4.2 All cables shall be exposed to the magnetic field for 1 m of their length.

10.4.3 Different induction coils may be selected for testing in the different orthogonal directions.

### 10.5 Test Result

**PASS.**

The performance criterion after tested EN 55024:

Temperature: 25.2 °C ; Humidity: 43 % ; Atm pres: 986 hPa ; Test Engineer: Evans

#### Mode 3: Full Load (Model No.: TEQ 300-7212WIR)

Power Frequency is 50 Hz, Magnetic field strength: **100** A/m

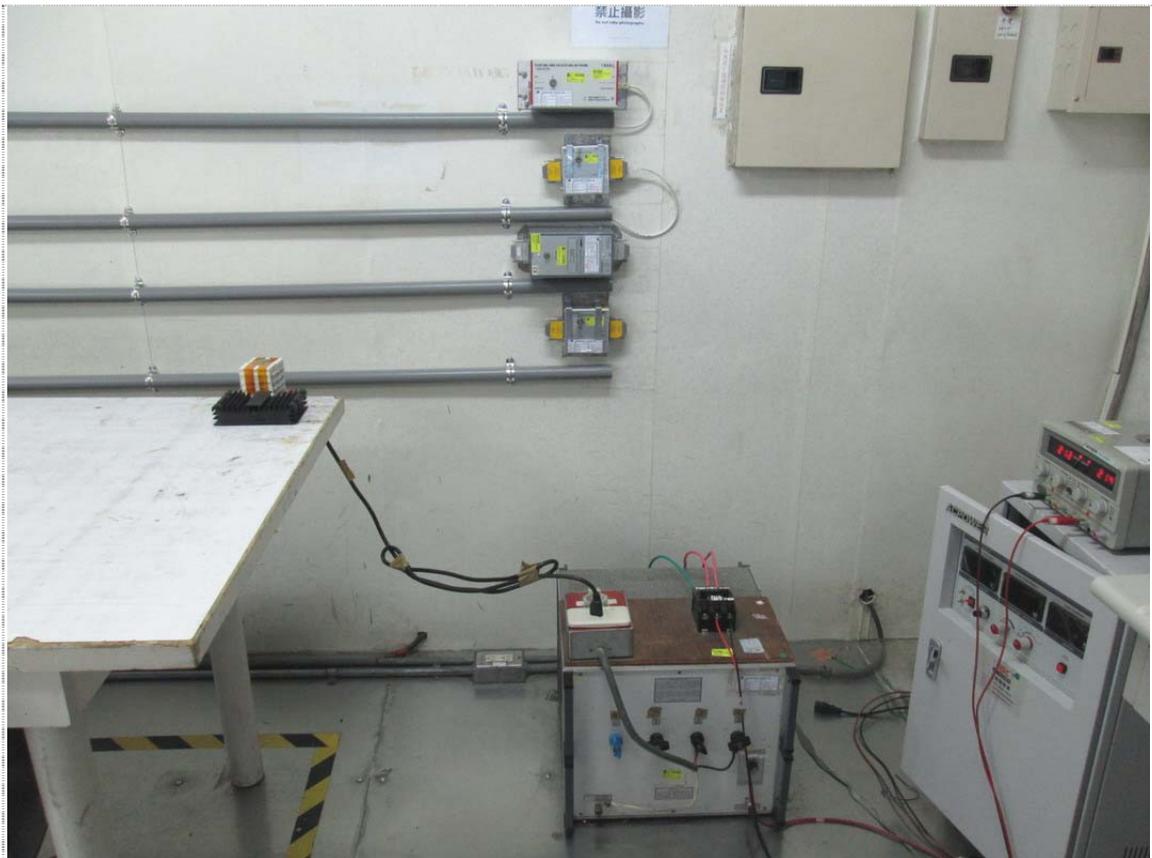
Performance criterion:  **A**  **B**  **C**

Power Frequency is 50 Hz, Magnetic field strength: **1000** A/m (1 sec)

Performance criterion:  **A**  **B**  **C**

# 11 Photographs of Test

## 11.1 Conducted Emission Measurement



Front View



Rear View

## 11.2 Radiated Emission Measurement

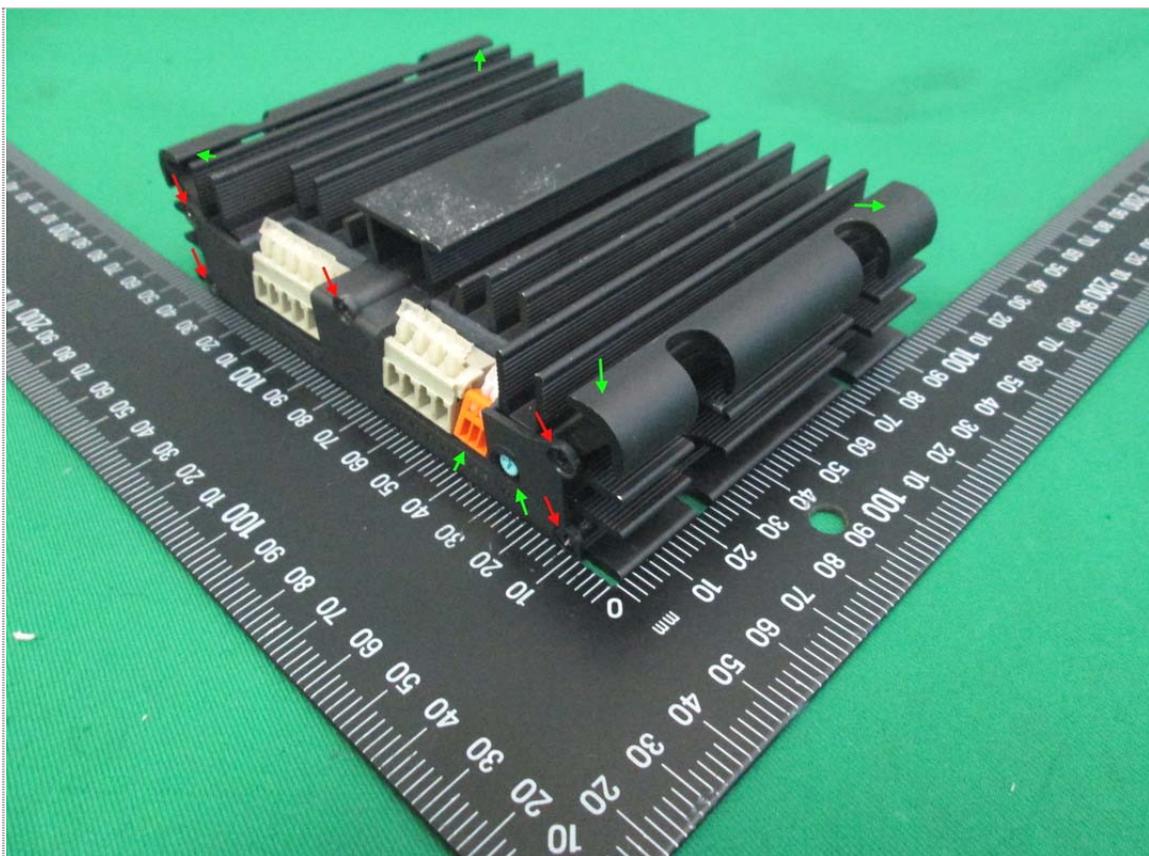


Front View

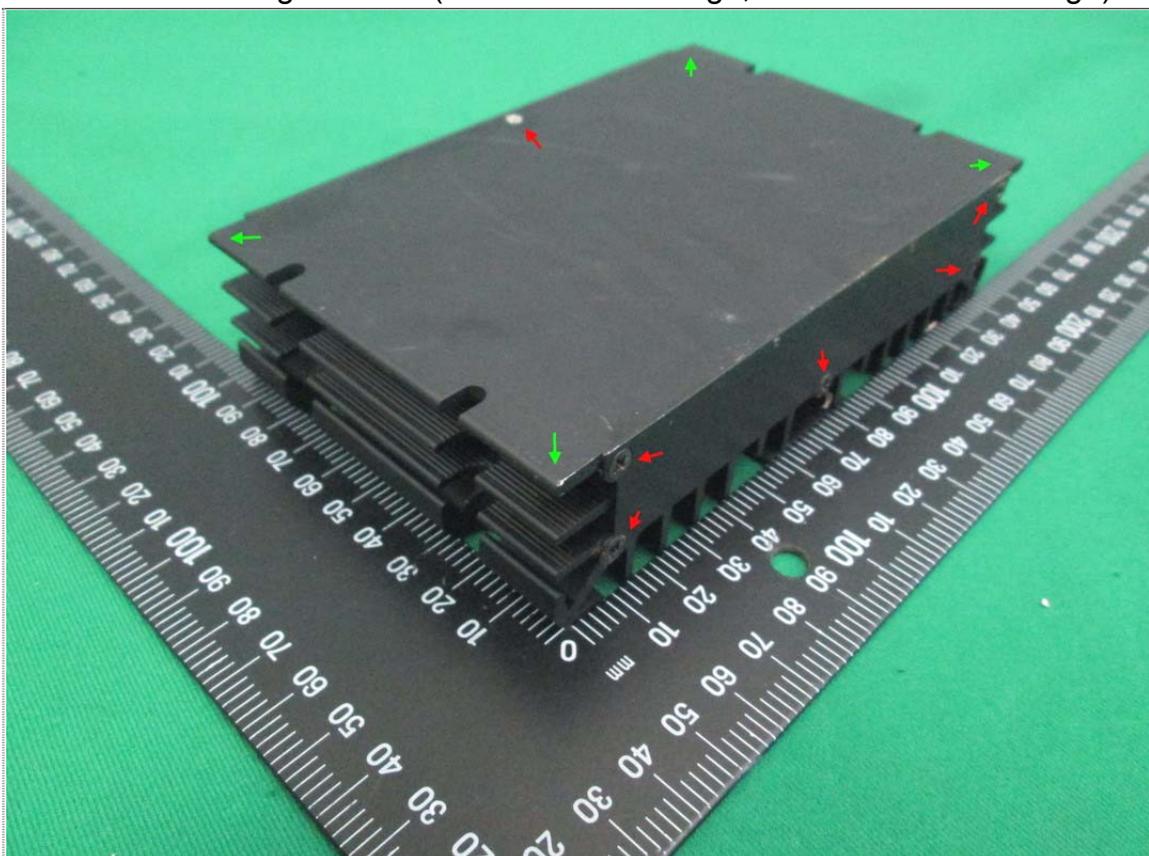


Rear View

### 11.3 Electrostatic Discharge Test Point



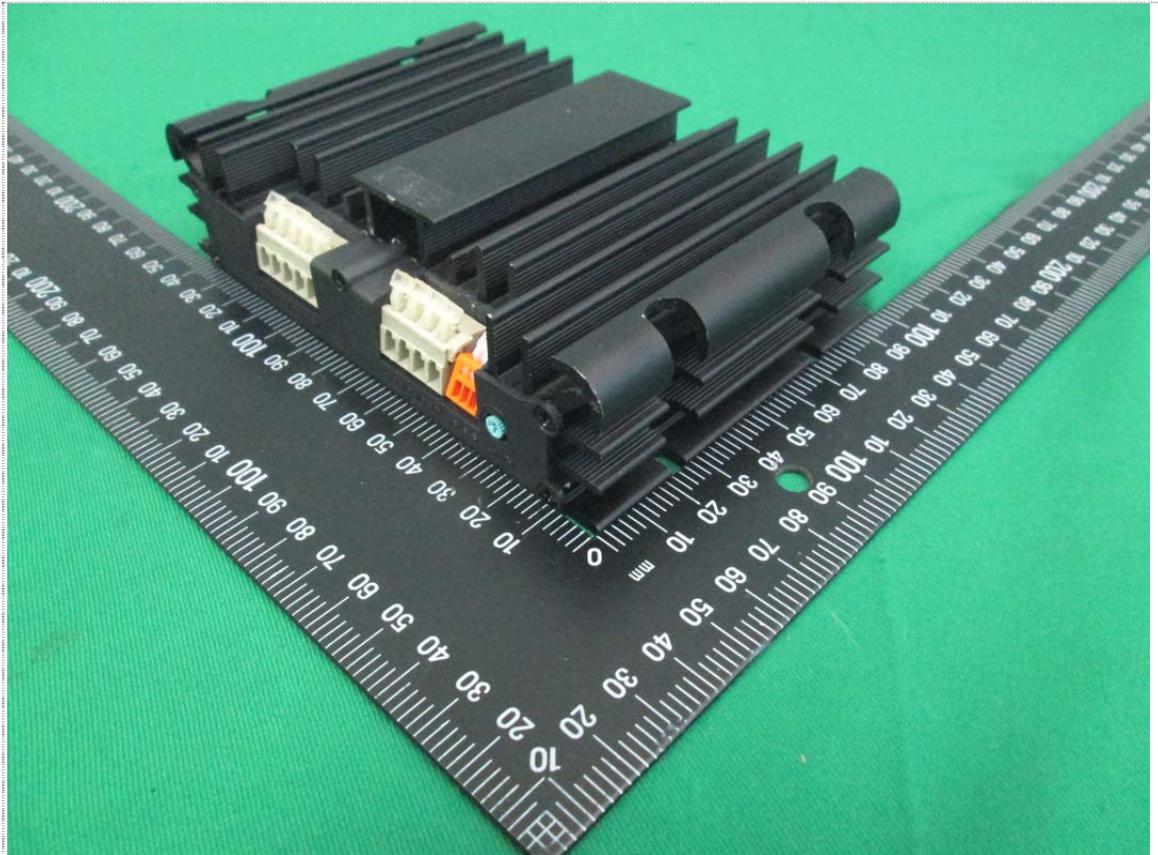
View of Discharge Point-1 (Green: Air Discharge; Red: Contact Discharge)



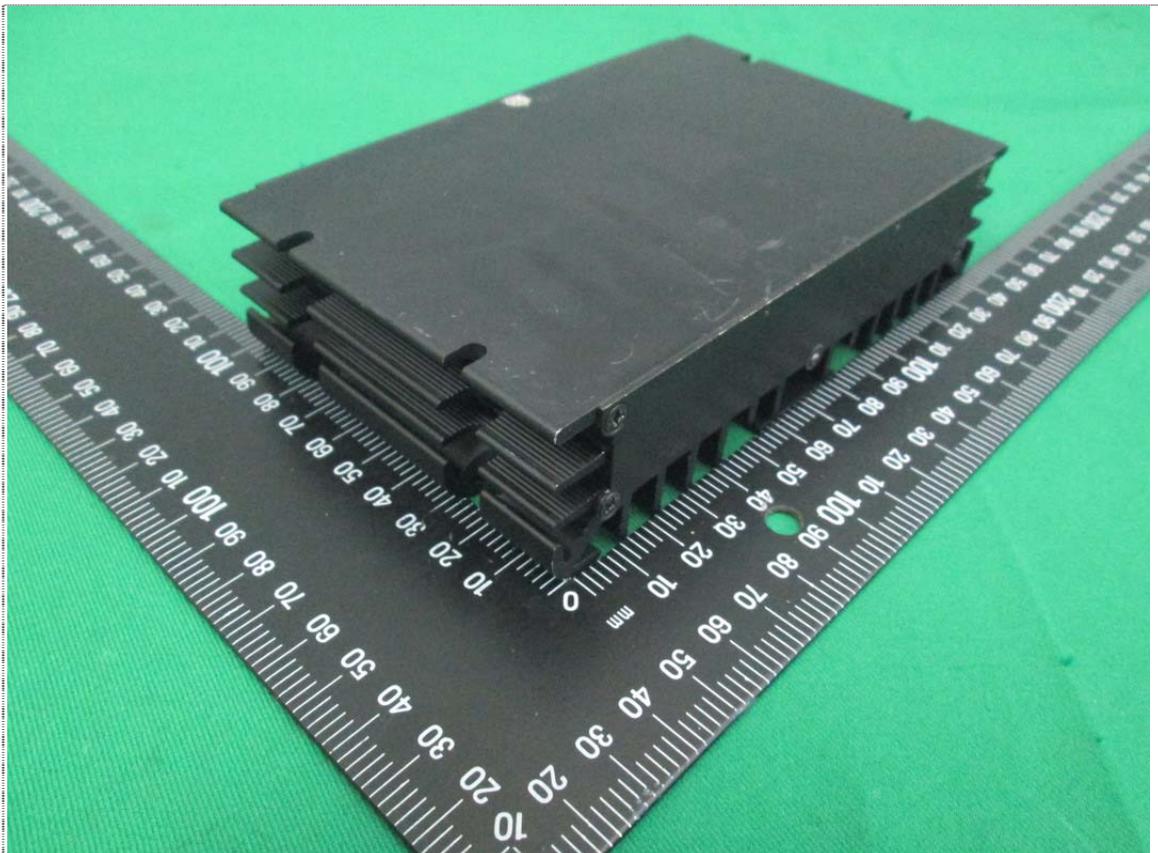
View of Discharge Point-2 (Green: Air Discharge; Red: Contact Discharge)

## 12 Photographs of EUT

### 12.1 Model No.: TEQ 300-4812WIR



Front View of EUT

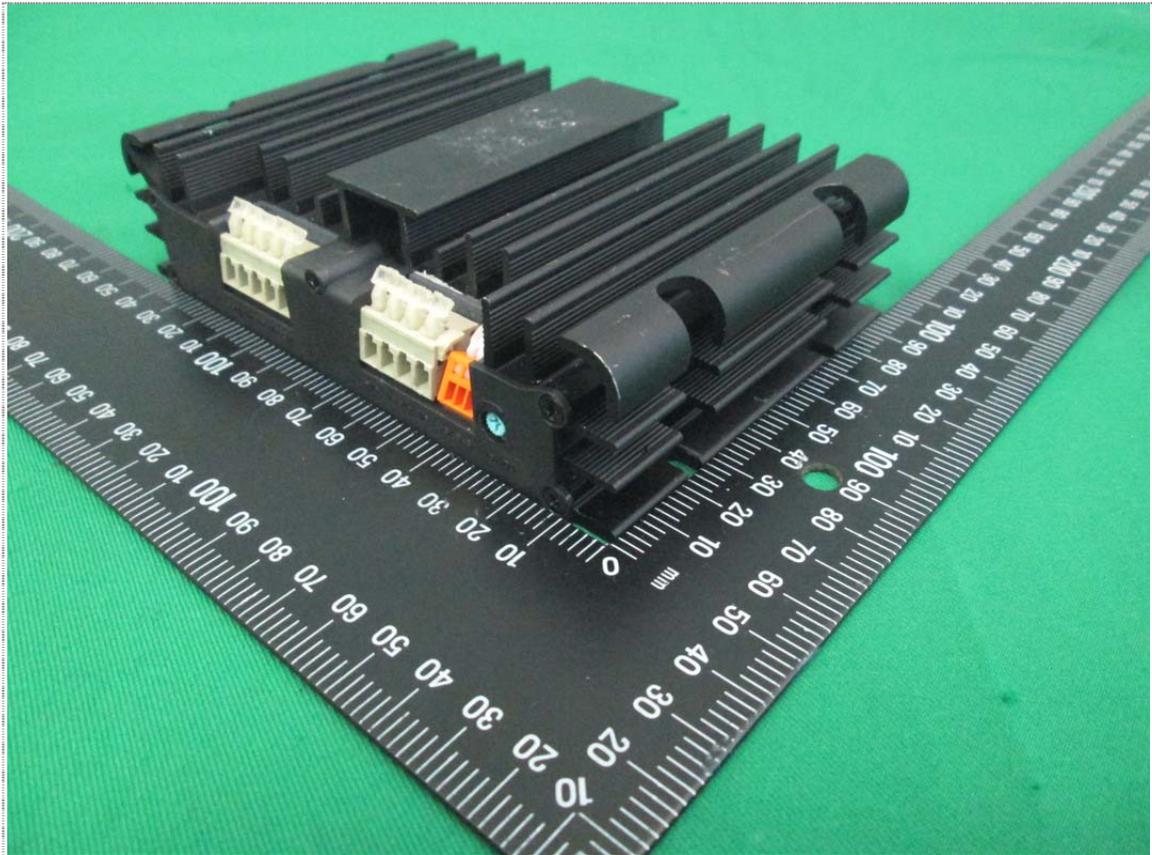


Rear View of EUT

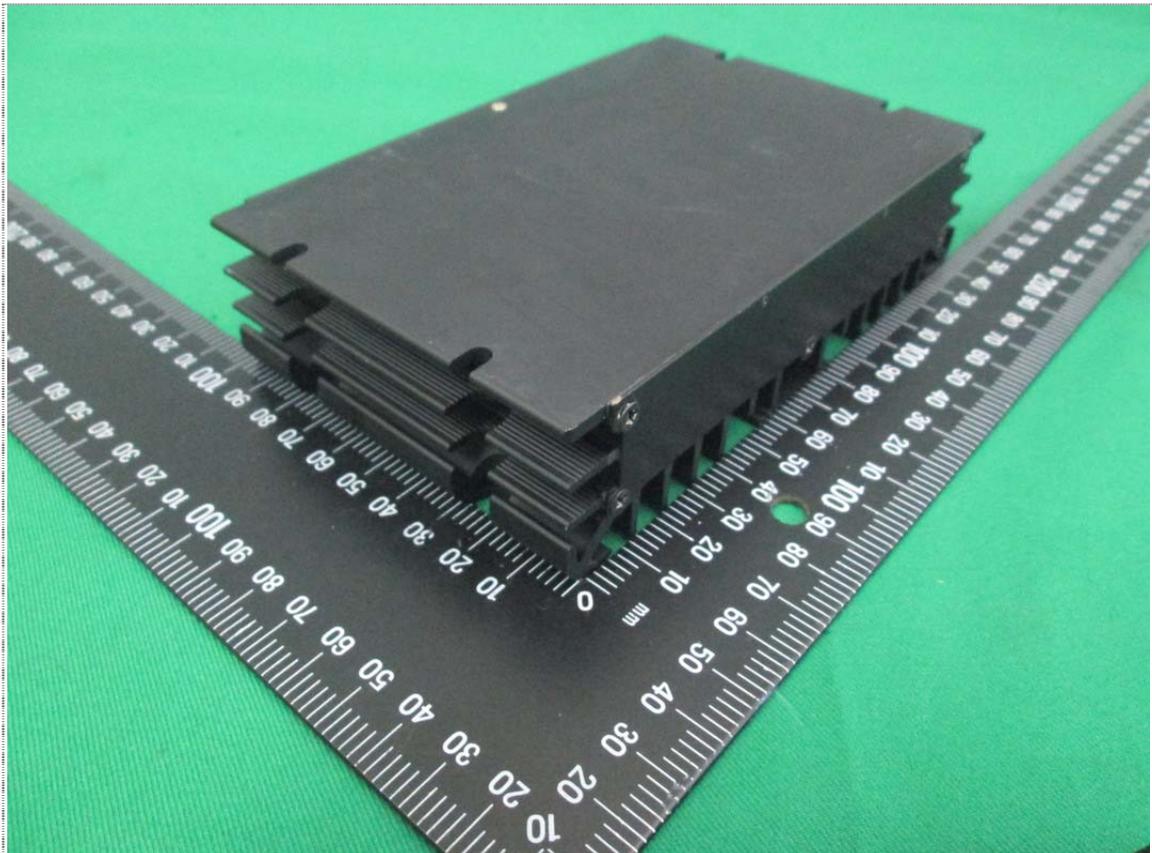


View of I/O Port

**12.2 Model No.: TEQ 300-4818WIR**



Front View of EUT

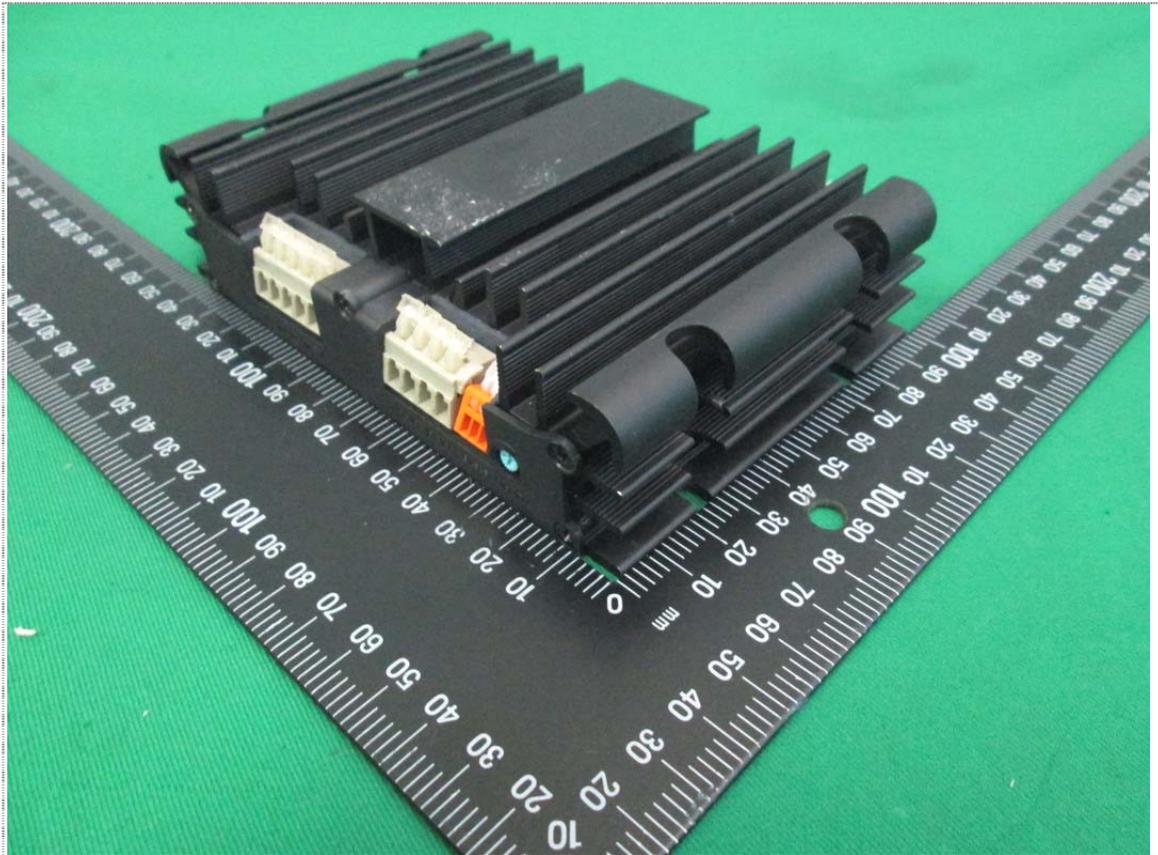


Rear View of EUT

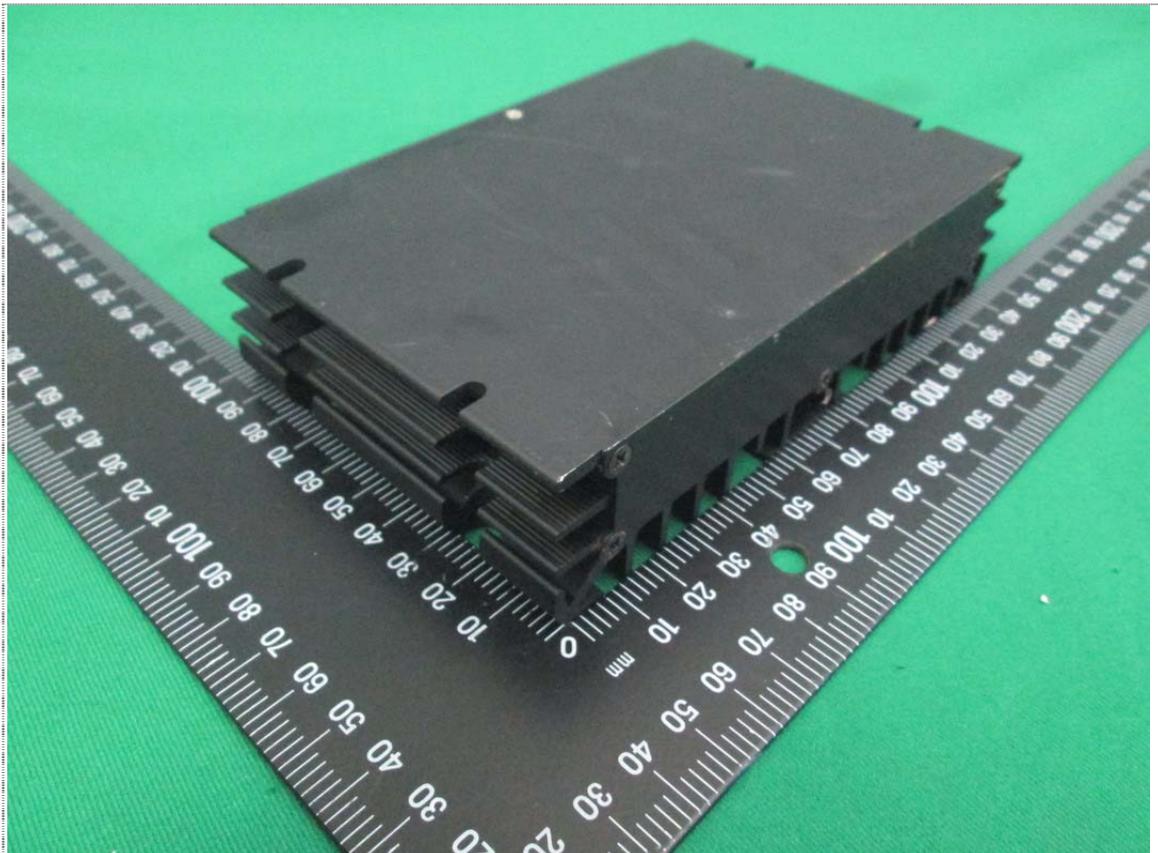


View of I/O Port

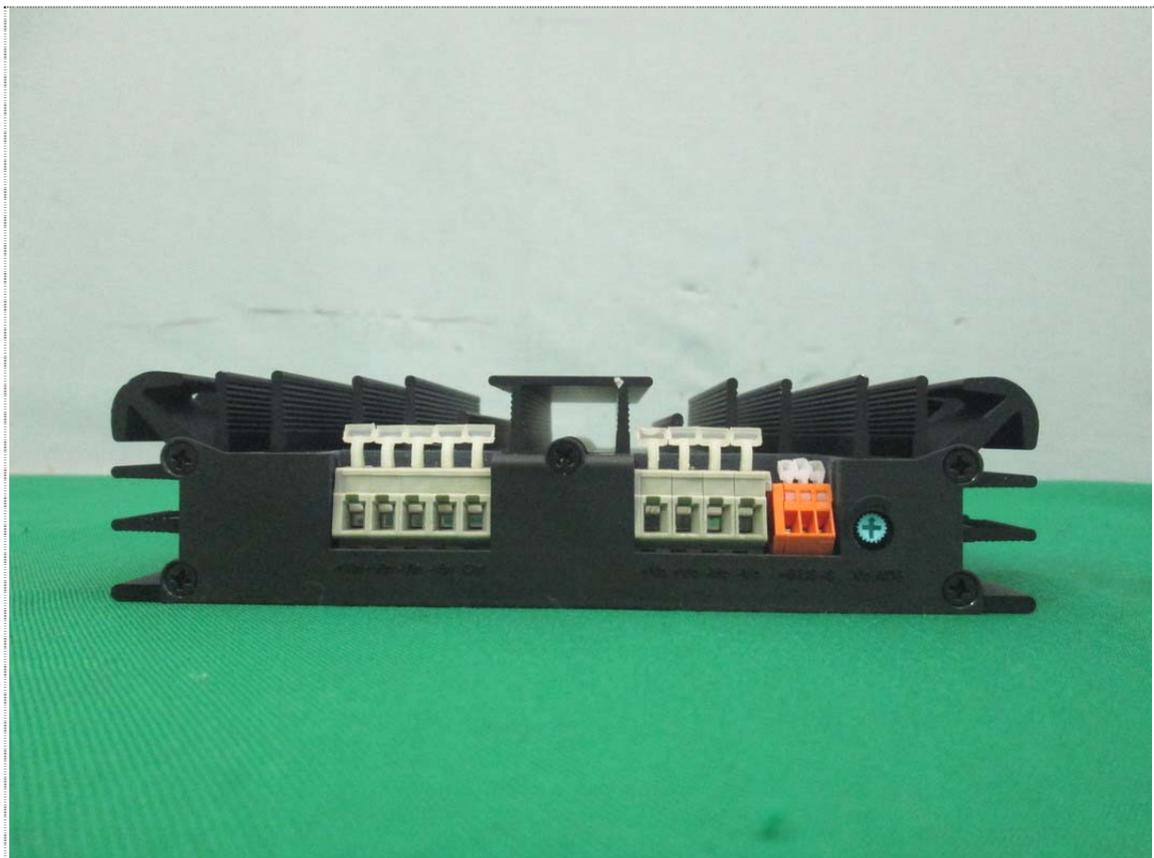
**12.3 Model No.: TEQ 300-7212WIR**



Front View of EUT



Rear View of EUT



View of I/O Port