

EMC TEST REPORT

FCC 47 CFR Part 15B Industry Canada ICES-003

Electromagnetic compatibility - Unintentional radiators

Report Reference No. G0M-1611-6080-EF01101-V01

Testing Laboratory: Eurofins Product Service GmbH

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15526 Reichenwalde

Germany

Accreditation:





A2LA Accredited Testing Laboratory, Certificate No.: 1983.01

FCC Filed Test Laboratory, Reg.-No.: 96970

IC OATS Filing assigned code: 3470A

Applicant's name TE Connectivity Germany GmbH

Address: Pfnorstraße 1

64293 Darmstadt

GERMANY

Test specification:

Standard.....: 47 CFR Part 15 Subpart B

ICES-003, Issue 6:2016

ANSI C63.4:2014

Equipment under test (EUT):

Product description ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model No. TXM030S012PNP8A, RXM030S012PNP8A

Additional Models None

Hardware version A2

Firmware / Software version RC15

FCC-ID: 2ADK7-ARISO IC: 12496A-ARISO

Test result Passed



Possible test case verdicts:

- not applicable to test object N/A

- test object does meet the requirement...... P (Pass)

- test object does not meet the requirement..... F (Fail)

Testing:

Compiled by: Andreas Pflug

Tested by (+ signature).....: Andreas Pflug

Approved by (+ signature):

Test Lab Engineer

Jens Zimmermann

Date of issue 2016-12-21

Total number of pages: 35

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Beside the tested models the following models also exist: TXM030S012PNP2A, RXM030S012PNP2A, TXM030S012PNP8A, RXM030S012PNP8B. The PCBs of all models are identical. Only the number of interface lines varies between the models.



Version History

Version	Issue Date	Remarks	Revised by
V01	2016-12-21	Initial Release	



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1 Equipment (Test item) Description

Description	ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter, Data Transceiver)		
Model	TXM030S012PNP8A, RXM030S012PNP8A		
Additional Models	None		
Serial number	None		
Hardware version	A2		
Software / Firmware version	RC15		
FCC-ID	2ADK7-ARIS	5O	
IC	12496A-ARIS	80	
Power supply	24 VDC		
	Model:	PSC20R-240	
AC/DC Adoptor	Vendor	Phihong	
AC/DC-Adaptor	Input	100-240V, 50-60Hz	
	Output 24V, 0.83A		
Manufacturer	TE Connectivity Germany GmbH Pfnorstraße 1 64293 Darmstadt GERMANY		
Highest emission frequency	Fmax [MHz] = 2482		
Device classification	Class A		
Equipment type	Tabletop		
Number of tested samples	1		



1.1 Photos – Equipment external

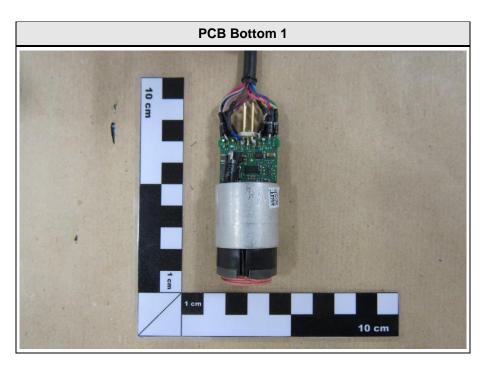


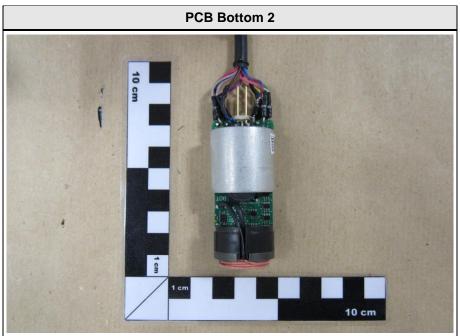






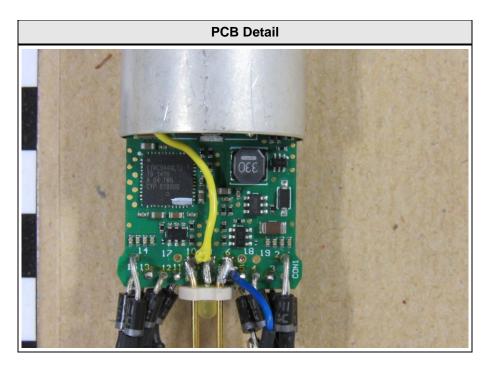
1.2 Photos – Equipment internal







Product Service

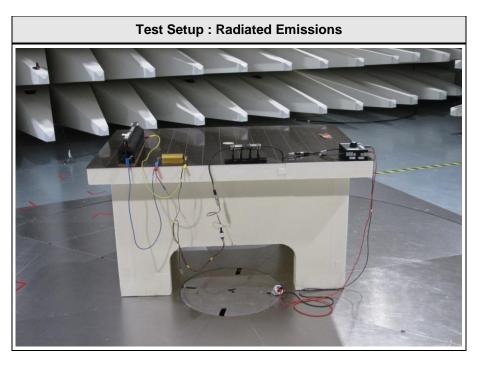


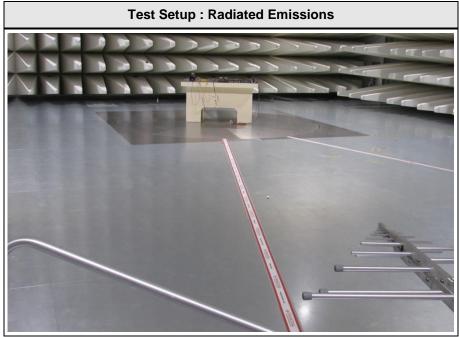




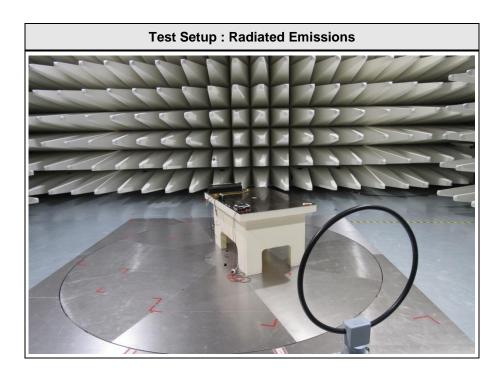


1.3 Photos – Test setup











1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments (e.g. serial no.)
AE	TX Test Box		TE Connectivity	
AE	RX adapter	RX M12 cable + connector	TE Connectivity	

*Note: Use the following abbreviations:

AE: Auxiliary/Associated Equipment, or SIM: Simulator (Not Subjected to Test)

CABL: Connecting cables

1.5 Input / Output Ports

Port #	Name	Type*	Max. Cable Length	Cable Shielded	Comments (e.g. Cat. of Cable)
1	GPIO - cable	I/O	-	No	Service only
2	GPIO - cable	I/O	-	No	Service only

*Note: Use the following abbreviations:

AC : AC power port
DC : DC power port
N/E : Non electrical

I/O : Signal input or output port
TP : Telecommunication port



1.6 Operating Modes and Configurations

Mode #	Description
1	The EUT has only one operating mode. When TX and RX completed their handshake, the TX sends Power to the RX (one direction only) while the Data is sent in both directions TX to RX and RX to TX.

Configuration #	EUT Configuration
1	with load



1.7 Test Equipment Used During Testing

	Measurement Software					
Description		Manufacturer	Name	Version		
	EMC Test Software	Dare Instruments	Radimation	2014.1.15		

Radiated emissions – 10m Chamber							
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due		
Biconical Antenna	R&S	HK 116	EF00012	2016-05	2019-05		
LPD-Antenne	R&S	HL 223	EF00187	2016-05	2019-05		
Horn antenna	Schwarzbeck	BBHA 9120D	EF00018	2016-09	2019-09		
EMI Test Receiver	Keysight	N9038A-526	EF01070	2016-08	2017-08		
RF Cable	Huber & Suhner	Sucoflex 106	-	System Cal.	System Cal		
RF Cable	Huber & Suhner	Multiflex 141	-	System Cal.	System Cal		

Conducted emissions							
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due		
AMN	Schwarzbeck	NSLK 8128	EF00975	2015-12	2016-12		
EMI Test Receiver	R&S	ESR7	EF00943	2016-10	2017-10		
EMI Test Receiver	Keysight	N9038A-526	EF01070	2016-08	2017-08		
Cable	-	RG58/U	-	System Cal.	System Cal.		



1.8 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer ($dB\mu V$) + A.F. (dB) = Net field strength ($dB\mu V/m$)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of $dB\mu V/m$). The FCC limits are given in units of $\mu V/m$. The following formula is used to convert the units of $\mu V/m$ to $dB\mu V/m$:

Limit $(dB\mu V/m) = 20*log (\mu V/m)$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF = Net Reading : Net reading - FCC limit = Margin 21.5 dB μ V + 26 dB = 47.5 dB μ V/m : 47.5 dB μ V/m - 57.0 dB μ V/m = -9.5 dB



2 Result Summary

FCC 47 CFR Part 15B, Industry Canada ICES-001						
Product Specific Standard	Requirement – Test	Reference Method	Result	Remarks		
ICES-001 Item 6.2	Radiated emissions	CISPR 11	PASS			
47 CFR 15.109	Radiated emissions	ANSI C 63.4	PASS			
47 CFR 15.107	AC power line conducted emissions	ANSI C63.4	PASS			
Remarks:	Remarks:					



3 Test Conditions and Results

3.1 Test Conditions and Results – Radiated emissions ICES-001

Radiated emission	ons acc. ICES-001					Verdict: PASS
Laboratory	Parameters:	R	Required prior to the test During		g the test	
Ambient To	Ambient Temperature			35 °C	2	3°C
Relative	Relative Humidity			60 %	4	1%
Test according	ng referenced			Referenc	e Method	
	dards			CISP	R 11	
Sample is tested	with respect to the			Equipme	ent class	
	e equipment class			Clas	ss A	
Test frequency ran	ge determined from			Highest emiss	ion frequency	
	sion frequency			Fmax [MF	lz] = 2482	
Fully configured sa	imple scanned over	Frequency range				
	equency range	0.15 MHz to 1 GHz				
Operation	ng mode	1				
Config	uration	1				
Comments:						
	Limits and	resul	ts Class A	(CISPR 11 grou	p 2)	
Frequency [MHz]	Quasi-Peak [dBµA/m] / 3m		Result	Quasi-Peak [dl	ΒμΑ/m] / 10m	Result
0.15 - 0.49	82		PASS	57.	5	PASS
0.49 – 1.705	0.49 – 1.705 72			47.	5	PASS
1.705 – 2.194 77			PASS	52.	5	PASS
2.194 – 3.95	68	PASS 4			5	PASS
3.95 - 11	43.5 – 28.5		PASS	18.	5	PASS
11 - 20	28.5		PASS	18.	5	PASS
20 - 30	18.5		PASS	8.9	5	PASS



Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

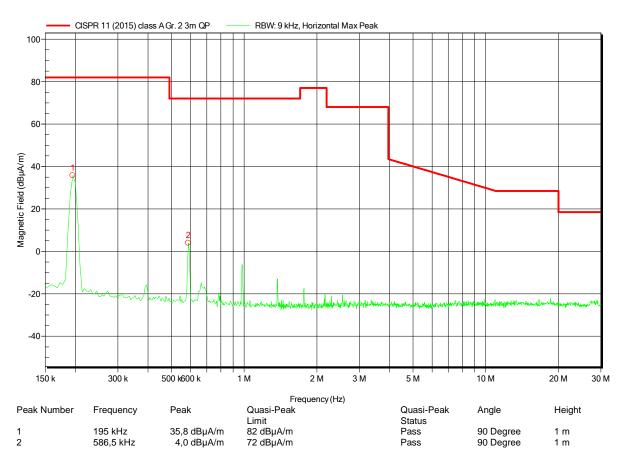
Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: HFH 2-Z2, Vertical

Measurement distance: 3 m

Mode: without load Test Date: 2016-12-19

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

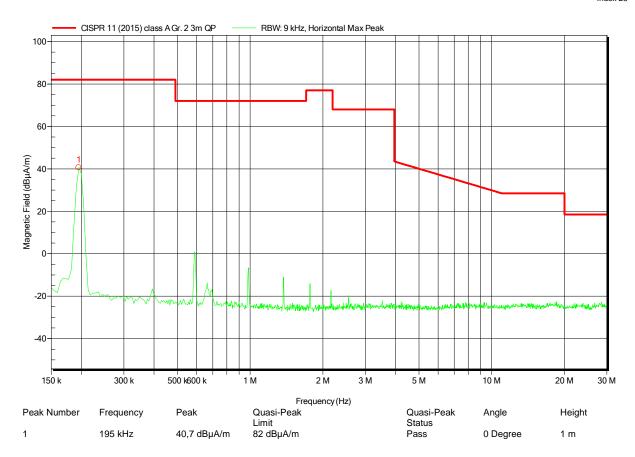
Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: HFH 2-Z2, Vertical

Measurement distance: 3 m

Mode: 660mA
position 2
Test Date: 2016-12-19

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

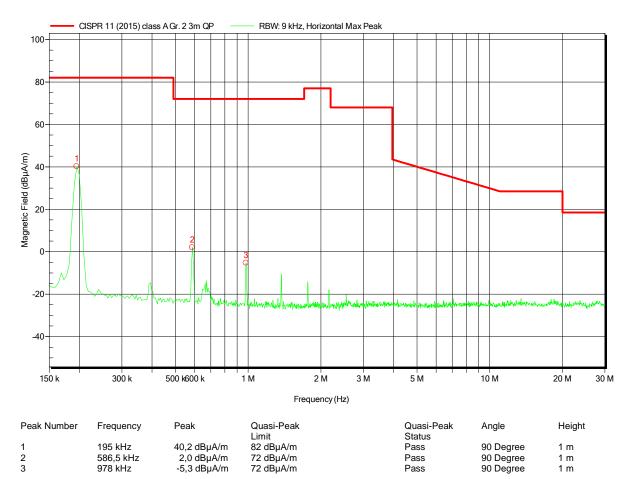
Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: HFH 2-Z2, Vertical

Measurement distance: 3 m
Mode: 660mA
position 1

Test Date: 2016-12-19

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

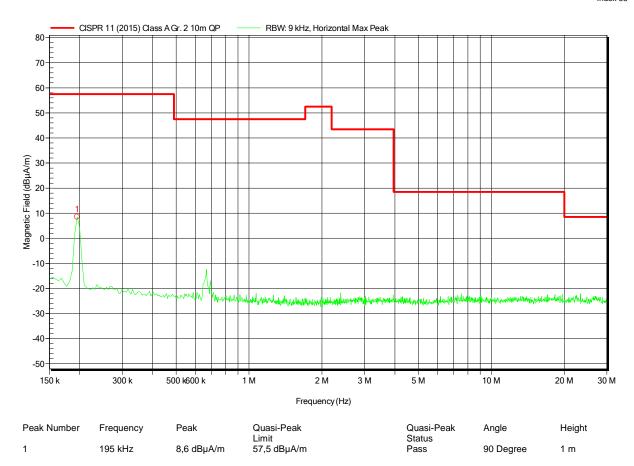
Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: HFH 2-Z2, Vertical

Measurement distance: 10 m
Mode: 660mA
position 1

Test Date: 2016-12-19

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

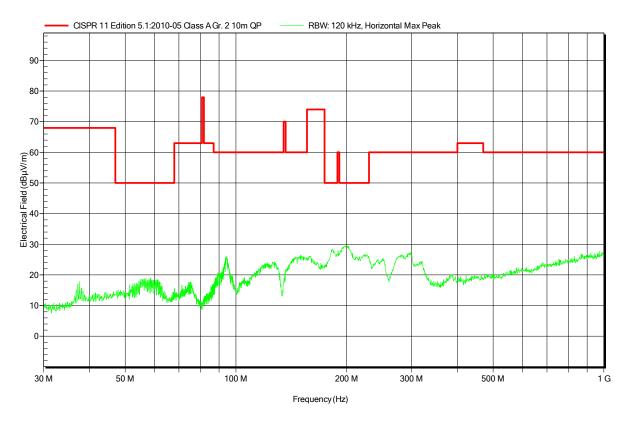
Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: Schwarzbeck VULB 9162, Horizontal

Measurement distance: 10 m Mode: 660mA Test Date: 2016-12-15

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

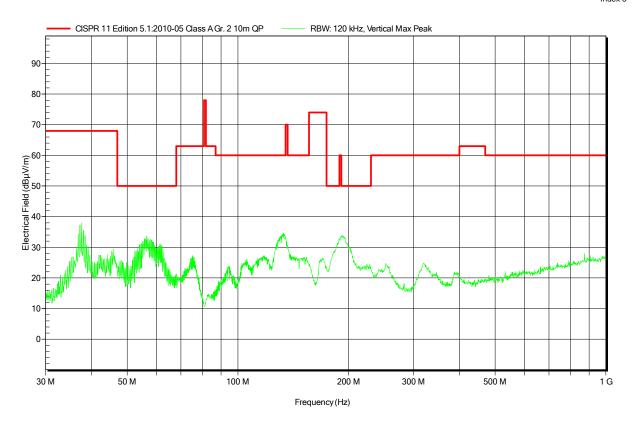
Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC
Antenna: Schwarzbeck VULB 9162, Vertical

Measurement distance: 10 m Mode: 660mA Test Date: 2016-12-15

Note:





3.2 Test Conditions and Results – Radiated emissions FCC part 15B

Radiated emissions acc. FCC 47 CFR 15.109 Verdict: PAS									
Laboratory	Parameters:	Requir	ed prior to the test	During the test					
Ambient Temperature			15 to 35 °C	23°C					
Relative	Humidity		30 to 60 %	41%					
Test according referenced		Reference Method							
	dards	ANSI C63.4							
Sample is tested	with respect to the	Equipment class							
	ne equipment class	Class A							
Test frequency ran	ge determined from		Highest emiss	sion freq	uency				
	sion frequency	Fmax [MHz] = 2482							
Fully configured sa	ample scanned over	Frequency range							
	requency range	30 MHz to 13 GHz							
Operating mode		1							
Configuration		1							
Comments:	Comments:								
	L	imits and ı	esults Class A						
Frequency [MHz]	Quasi-Peak [dBµV/r	n] Result	Average [dBµV/m]	Result	Peak [dBµV/m]	Result			
30 – 88	39	PASS	-		-	-			
88 – 216	43.5	PASS	-		-	-			
216 – 960	46.5	PASS	-		-	-			
960 – 1000	49.5	PASS	-		-	-			
> 1000	-	-	49.5	PASS	69.5	PASS			
Comments:		•							



Test Procedure:

The test site is in accordance with ANSI C63-4:2014 requirements and is listed by FCC. The measurement procedure is as follows:

Exploratory measurement:

- The EUT was placed on a non-conductive table at a height of 0.8m.
- The EUT and support equipment, if needed, were set up to simulate typical usage.
- Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage.
- The antenna was placed at a distance of 3 or 10 m.
- The received signal was monitored at the measurement receiver.
 - Cables not bundled were manipulated within the range of likely arrangements to produce the highest emission amplitude
 - To maximize the suspected emissions the EUT is rotated 360 degrees. If the signal exceeds the previous amplitude, go back to the corresponding azimuth and manipulate the cables again for maximizing the emissions if possible.
 - Move the antenna from 1 to 4m to maximize the suspected highest amplitude signal.
- This procedure has to be performed in both antenna polarizations, horizontal and vertical.
- The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3.

Final measurement:

- The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver
- A broadband hybrid (bicon/log) antenna was used for the frequency range 30 1000 MHz.
- Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast
- The EUT and cable arrangement were based on the exploratory measurement results
- Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.
- The test data of the worst-case conditions were recorded and shown on the next pages.



Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC
Antenna: Schwarzbeck VULB 9162, Vertical

Measurement distance: 10 m Mode: 660mA Test Date: 2016-12-15

Note:

Fcc \$15.109 Class A QP — RBW 120 kHz — RBW: 120 kHz

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	37,578 MHz	36,6 dBµV/m	39,1 dBµV/m	-2,5 dB	Pass	0 Degree	1 m
2	56,796 MHz	31,9 dBµV/m	39,1 dBµV/m	-7,2 dB	Pass	0 Degree	1 m
3	132,714 MHz	33,7 dBµV/m	43,5 dBµV/m	-9,8 dB	Pass	0 Degree	1 m
4	37,194 MHz	36 dBµV/m	39,1 dBµV/m	-3,0 dB	Pass	0 Degree	1 m
5	37,962 MHz	34,4 dBµV/m	39,1 dBµV/m	-4,7 dB	Pass	0 Degree	1 m



Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

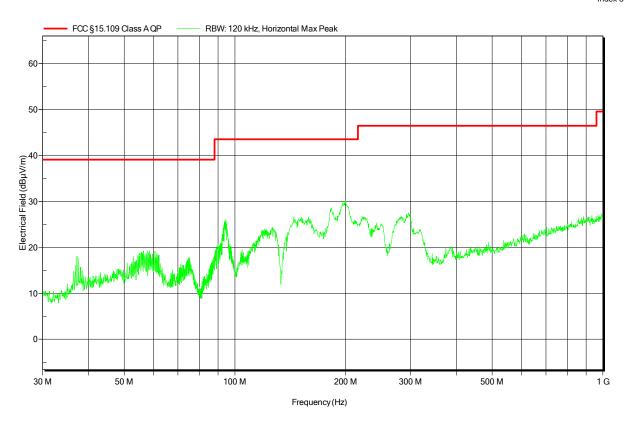
Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: Schwarzbeck VULB 9162, Horizontal

Measurement distance: 10 m Mode: 660mA Test Date: 2016-12-15

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

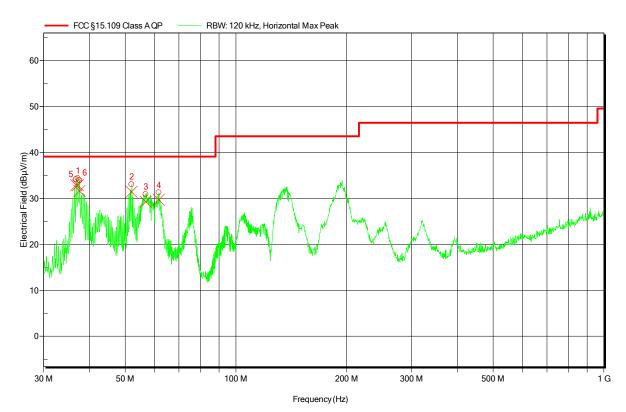
Test Conditions: Tnom: 23°C, Unom: +24VDC

Antenna: Schwarzbeck VULB 9162, Horizontal

Measurement distance: 10 m Mode: 300mA Test Date: 2016-12-15

Note:

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Daal Mossies	F	O	O ! D !.	O	O	AI	11-1-64
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	37,182 MHz	32,9 dBµV/m	39,1 dBµV/m	-6,2 dB	Pass	0 Degree	1 m
2	52,05 MHz	31,4 dBµV/m	39,1 dBµV/m	-7,6 dB	Pass	0 Degree	1 m
3	56,862 MHz	29,2 dBµV/m	39,1 dBµV/m	-9,8 dB	Pass	0 Degree	1 m
4	61,728 MHz	29,7 dBµV/m	39,1 dBµV/m	-9,4 dB	Pass	0 Degree	1 m
5	36,786 MHz	32,9 dBµV/m	39.1 dBµV/m	-6,2 dB	Pass	0 Degree	1 m
6	37.566 MHz	31.6 dBuV/m	39.1 dBuV/m	-7.5 dB	Pass	0 Degree	1 m



Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

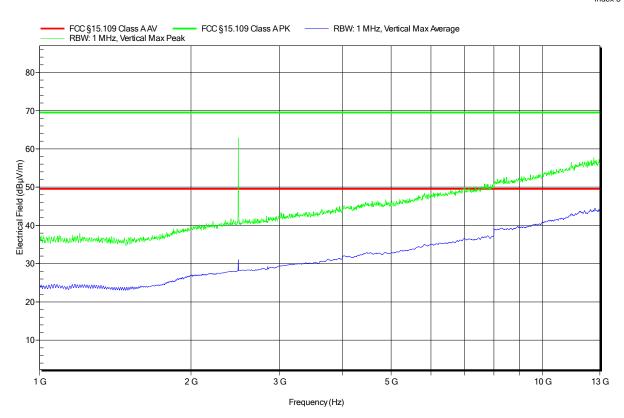
Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC Antenna: ETS-Lindgren 3117, Vertical

Measurement distance: 3 m
Mode: 660mA
Test Date: 2016-12-15

Note:





Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH

EUT Name: ARISO Contactless Connectivity (PN 2287598-3, Power Transmitter,

Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

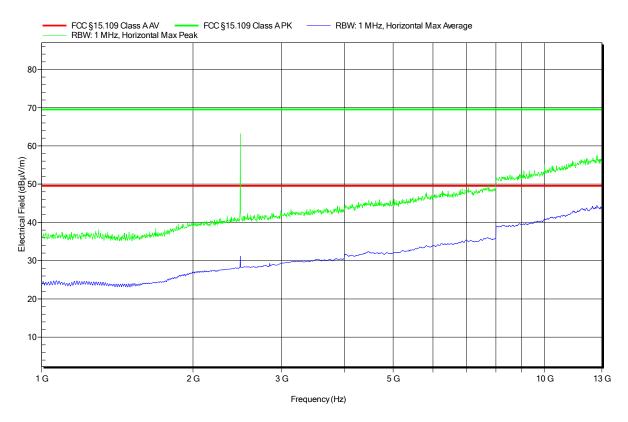
Test Site: Eurofins Product Service GmbH

Operator: Mr. Pflug

Test Conditions: Tnom: 23°C, Unom: +24VDC Antenna: ETS-Lindgren 3117, Horizontal

Measurement distance: 3 m
Mode: 660mA
Test Date: 2016-12-15

Note:





3.1 Test Conditions and Results – AC power line conducted emissions

Conducted emission	107		Verdict: PA				
Laboratory Para	Req	uired prior to the t	est	Durin	g the test		
Ambient Tempo	erature		15 to 35 °C 23°C			23°C	
Relative Hum		30 to 60 %		41%			
Test according referenced standards		Reference Method					
		ANSI C63.4					
Fully configured sample	e scanned over		Fi	requency	y range		
the following freque		0.15 MHz to 30 MHz					
Sample is tested with	respect to the	Equipment class					
requirements of the equipment class		Class A					
Points of Appli	Application Interface						
AC Mains	LISN						
Operating m	1						
Configurati	1						
Limits and results Class A							
Frequency [MHz]	Quasi-Peak [dBµV]	Result	Avera	age [dBµV]	Result	
0.15 to 5	79		PASS		66	PASS	
5 to 30	73		PASS		60	PASS	
Comments: * Limit decreases linearly with the logarithm of the frequency.							



Test Procedure:

The test site is in accordance with ANSI C63-4:2014 requirements and is listed by FCC. The measurement procedure is as follows:

Exploratory measurement:

- The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
- The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
- The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
- The LISN measurement port was connected to a measurement receiver
- I/O cables were bundled not longer than 0.4 m
- Measurement was performed in the frequency range 0.15 30MHz on each current-carrying conductor
- To maximize the emissions the cable positions were manipulated
- The worst configuration of EUT and cables is shown on a test setup picture at item 1.3

Test Procedure:

Final measurement:

- The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
- The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
- The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
- The LISN measurement port was connected to a measurement receiver
- The EUT and cable arrangement were based on the exploratory measurement results
- The test data of the worst-case conditions were recorded and shown on the next pages.



EMI voltage test in the ac-mains according to FCC 15B

Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH EUT Name: ARISO Contactless Connectivity

(PN 2287598-3, Power Transmitter, Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Laurisch

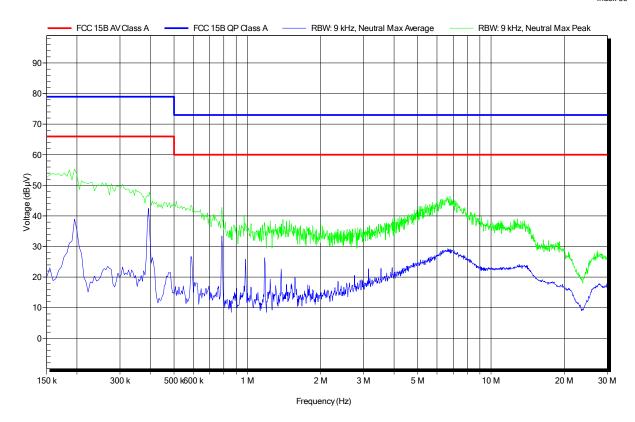
Test Conditions: Tnom: 23°C, Unom: 24 VDC via AC/DC-adapter

LISN: ESH3-Z5 (N)

Mode: 14 dBM 200 kHz CP2

Test Date: 2016-12-21

Note: Pass





EMI voltage test in the ac-mains according to FCC 15B

Project number: G0M-1611-6080

Applicant: TE Connectivity Germany GmbH EUT Name: ARISO Contactless Connectivity

(PN 2287598-3, Power Transmitter, Data Transceiver)

Model: TXM030S012PNP8A, RXM030S012PNP8A

Test Site: Eurofins Product Service GmbH

Operator: Mr. Laurisch

Test Conditions: Tnom: 23°C, Unom: +24VDC via AC/DC-adapter

LISN: ESH3-Z5 (L)

Mode: 14 dBM 200 kHz CP2

Test Date: 2016-12-21

Note: Pass

