

Produkte
Products

Prüfbericht - Nr.: 14029350 002

Test Report No.:

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Auftraggeber: Remotec Technology Ltd.
Client:
 Room 2907 – 2908
 Skyline Tower
 39 Wang Kwong Road
 Kowloon Bay, Kowloon, Hong Kong

Gegenstand der Prüfung: Zwave Thermostat
Test Item:

Bezeichnung: BW8031US **Serien-Nr.:** **Engineering sample**
Identification: Serial No.:

Wareneingangs-Nr.: A000035019-001 **Eingangsdatum:** 13.01.2014
Receipt No.: **Date of Receipt:**

Zustand des Prüfgegenstandes bei Anlieferung: Test samples received are sufficient for testing and not damaged.
Condition of test item at delivery:

Prüfort: TÜV Rheinland Hong Kong Ltd.
Testing Location: 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong
Hong Kong Productivity Council
 HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong

Prüfgrundlage: FCC Part 15, Subpart C
Test Specification:

Prüfergebnis: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).
Test Result: The test item passed the test specification(s).

Prüflaboratorium: TÜV Rheinland Hong Kong Ltd.
Testing Laboratory: 8-10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

geprüft / tested by:

kontrolliert / reviewed by:

06.03.2014 Joey Leung
 Project Engineer



06.03.2014

Sharon Li
 Section Manager



Sonstiges / Other Aspects:

FCC ID: M7N-BW8030US

This report is prepared for Class II permissive change

Abkürzungen: P(pass) = entspricht Prüfgrundlage
 F(fail) = entspricht nicht Prüfgrundlage
 N/A = nicht anwendbar
 N/T = nicht getestet

Abbreviations: P(pass) = passed
 F(fail) = failed
 N/A = not applicable
 N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicate in extracts. This test report does not entitle to carry any safety mark on this or similar products.

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Appendix 1: Test Results

Appendix 2: Test Setup

Appendix 3: EUT External Photo

Appendix 4: EUT Internal Photo

Appendix 5: Block Diagram, FCCID Label, Schematics and User manual.

Test Summary

Conducted Emissions

Result: Pass

20dB bandwidth

Result: Pass

Radiated Emission of Carrier Frequency

Result: Pass

Spurious Radiated Emissions

Result: Pass

List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Radiated Emission

Equipment used	Manufacturer	Model No.	S/N	Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	12 Apr 2014
Cable	Hubersuhner	SUCOFLEX 104	72799 /6	30 Mar 2014
Test Receiver	R & S	ESU40	100190	19 Mar 2014
Bi-conical Antenna	R & S	HK116	100242	11 Jun 2015
Log Periodic Antenna	R & S	HL223	841516/020	10 Jun 2015
Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 001	15 Nov 2015
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3123A00437	03 Oct 2015
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	28 Oct 2015
Horn Antenna	EMCO	3115	9002-3351	11 Jun 2015
Active Loop Antenna	EMCO	6502	9107-2651	21 Mar 2014
FSP 30 Spectrum Analyser	R & S	FSP 30	100007/030	03 Dec 2014

Conducted Emission

Equipment used	Manufacturer	Model No.	S/N	Due Date
Test Receiver	Rohde & Schwarz	ESCS30	100201	28 Feb 2015
LISN	Rohde & Schwarz	ENV216	100273	26 Feb 2015
Double Shield Cable	Radiall	RG142	Nil	13 Sep 2014

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General Product Information

Product Function and Intended Use

The equipment under test (EUT) is a remote control of home automation system. It is able to control the wireless enabled equipment at the home. It uses 908.4MHz as a communication channel. There is only one frequency channel in this product.

FCC ID: M7N-BW8030US

Model	Product description
BW8031US	Zwave Thermostat

Ratings and System Details

	Transmitter
Operating Frequencies	: 908.4MHz
Number of channels	: 1
Type of antenna	: Integral antenna
Power supply	: 24VAC or 6.0VDC, 4 x AA size batteries
Ports	: Yes

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Independent Operation Modes

The basic operation modes are:

- Control of home electrical product
- Others, please refer to user manual for further details

Submitted Documents

The submitted documents are listed as follow:

- Circuit diagram
- Block diagram
- Bill(s) of material
- User manual
- FCC ID label

Remark

The following changes were implemented on the modified product

- 1) The power system change to DC-DC step down converter for increasing the power rating;
- 2) The MCU's internal analog-to-digital circuitry is used to sample the thermistor data.

Hence the test for Part 15.207 Conducted Emission, Part 15.215(c) 20dB bandwidth, Part 15.249(a), (d) & (e) Spurious Radiated Emission were re-evaluated in this test report.

Due to the spurious radiated emission result was worse than the previous, permissive class II change report is submitted to TCB.

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Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- There was no special software to exercise the device.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- Testing board provided by the manufacturer
- AC/AC Power transformer
Model number: JT-1200
Input: 120VAC 60Hz
Output: 24VAC 28.8VA max.

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2003.

The equipment under test (EUT) was placed at the middle of the 80 cm height turntable, and the turntable is 3 meters far from the measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360 °, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Average value of FS = FS – Average factor.

Average Factor = $20 \log \text{duty cycle}$.

Test Results

Section 15.207 – Conducted Emission

Pass

Test Specification : FCC Part 15 Section 15.207
 Detector Function : Quasi-Peak and Average
 Supply Voltage : 120VAC 60Hz

Live measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak (dB μ V)	Average (dB μ V)	Limit QP (dB μ V)	Limit AV (dB μ V)	Verdict
0.15 – 0.5	0.150	39.2	12.7	66 – 56	56 – 46	Pass
	0.170	39.0	12.3	66 – 56	56 – 46	Pass
	0.182	37.7	12.2	66 – 56	56 – 46	Pass
> 0.5 – 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
Neutral measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak (dB μ V)	Average (dB μ V)	Limit QP (dB μ V)	Limit AV (dB μ V)	Verdict
0.15 – 0.5	0.150	39.3	12.7	66 – 56	56 – 46	Pass
	0.162	39.4	13.4	66 – 56	56 – 46	Pass
	0.178	38.1	11.8	66 – 56	56 – 46	Pass
> 0.5 – 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass

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Section 15.215 (c) – 20dB Bandwidth

Pass

Test Specification : FCC Part 15 Section 15.215(c)
Detector Function : Peak
Measurement BW : 100kHz
Supply Voltage : 6.0V DC from batteries
Operating band : 908MHz

Frequency	20dB Bandwidth	Frequency at 20dB BW closest to Band Edge	Delta to Band Edge
(MHz)	(MHz)	(MHz)	(MHz)
908.400	0.260	908.310	-6.310

For test results, please refer to Appendix 1.

Limit	Section 15.215(c)
Frequency band (MHz)	
902 – 928	

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Section 15.249 (a) – Radiated Emission of Carrier Frequency
Pass

Test Specification : FCC Part 15 Section 15.249(a)
 Test Method : ANSI 63.4-2003
 Measurement Location : Semi Anechoic Chamber
 Measurement Distance : 3m
 Detector Function : Quasi-Peak
 Measurement BW : 120kHz
 Supply Voltage : 6.0V DC from batteries

Polarization: Vertical

Frequency (MHz)	Field strength at 3m (dB μ V/m)	Limit (dB μ V/m)	Delta to Limit (dB)
908.396	82.1	94.0	-11.9

Polarization: Horizontal

Frequency (MHz)	Field strength at 3m (dB μ V/m)	Limit (dB μ V/m)	Delta to Limit (dB)
908.396	85.7	94.0	-8.3

Limit
Section 15.249(a)

Frequency band (MHz)	Peak Emission	
	(μ V/m)	(dB μ V/m)
902 – 928	50,000	94.0

As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Section 15.249 (a, c, d, e) – Spurious Radiated Emissions

Pass

Test Specification	:	FCC Part 15 Section 15.249(a, c, d and e)
Test Method	:	ANSI 63.4-2003
Measurement Location	:	Semi Anechoic Chamber
Measurement Distance	:	3m
Detector Function	:	<1000MHz, Quasi-Peak >=1000MHz, Peak and Average
Measurement BW	:	<1000MHz, 120kHz >=1000MHz, 1MHz
Supply Voltage	:	6.0V DC from batteries

Polarization: Vertical

Frequency (MHz)	Field strength at 3m (dB μ V/m)	Detector (PK / AV)	Limit at 3m (dB μ V/m)	Delta to Limit (dB)
1816.790	47.8	PK	74.0	-26.2
	29.8	AV	54.0	-24.2
2725.184	40.8	PK	74.0	-33.2
	22.8	AV	54.0	-31.2

Polarization: Horizontal

Frequency (MHz)	Field strength at 3m (dB μ V/m)	Detector (PK / AV)	Limit at 3m (dB μ V/m)	Delta to Limit (dB)
1816.789	44.1	PK	74.0	-29.9
	25.8	AV	54.0	-28.2
2725.185	43.1	PK	74.0	-30.9
	24.1	AV	54.0	-29.9

The radiated spurious emission measurement results were well below the limit as stated in 15.209 and 15.205

Remark: (1) ‘*’ indicates the frequency of the emissions fall into the restricted band as defined in Section 15.205(a). They comply with the radiated emission limits specified in Section 15.209.
 (2) Emissions radiated outside the specified frequency bands, except for harmonics, were attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation
 (3) From the lowest oscillator frequency 8MHz to 30MHz, there is no spurious emission found.

Limit	Section 15.249(a)		
Fundamental Frequency (MHz)	Field strength of Harmonics (AV) (μ V/m)	Field strength of Harmonics (AV) (dB μ V/m)	Measurement distance (m)
902-928 MHz	500	20*log(500) = 53.98	3

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Limit

Section 15.249(d)

Emissions radiated outside of the specified frequency bands as listed in 15.249(a), except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Limit

Section 15.209

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

Limit for Radiated Emission under Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
30-88	100	$20\log(100) = 40.00$	3
88-216	150	$20\log(150) = 43.52$	3
216-960	200	$20\log(200) = 46.02$	3
960-2500	500	$20\log(500) = 53.98$	3

The emission limits shown in the above table below 1000MHz are based on measurements employing a CISPR quasi-peak detector and above 1000 MHz are based on the measurements employing average and peak detectors.