

Test Report No. EEE/R21/1038
dated 22 JUL 2021



TUV SUD (Thailand) Limited



Thailand

Add value.
Inspire trust.

Note: This report is issued subject to TUV SUD (Thailand) Limited's "Terms and Conditions Governing Technical Services". The terms and conditions governing the issue of this report are set out as attached within this report.

FORMAL REPORT ON TESTING IN ACCORDANCE WITH
CISPR 14-2: 2015
[IEC 61000-4-4: 2012 and IEC 61000-4-5: 2014+A1: 2017]
OF

INSTANTANEOUS WATER HEATER
(CLOSED WATER HEATER)
[Model: CUBE 6000R]

TEST FACILITY

TÜV SÜD (Thailand) Limited
111 Moo 9 Paholyothin Rd.,
Klong 1, Klong Luang,
Pathumthani 12120 Thailand

CLIENT

PEN K Inter Trading Co., Ltd.
1000/63-64 PB Tower 16th Floor,
Sukhumvit 71 Rd., North Klongtan,
Wattana, Bangkok 10110 Thailand.

Tel : (66) 0-2713-1100 Tel : (66) 0-2713-1100

JOB NUMBER

EEE21/1038

SAMPLE SUBMISSION DATE /
TEST DATE

17 Jun 2021/
21 Jun - 20 Jul 2021

CONDITION OF SAMPLE
RECEIVED

The samples are received as finished goods, no scratch /damage of
sample was observed. No modification done prior tests.

PREPARED BY

Sarawoot Boriboon
Assistant Product Manager

APPROVED BY

Banchedr Kajchamaporn
Manager, CPS

Laboratory:
TÜV SÜD (Thailand) Limited
Thailand Science Park,
111 Moo 9 Paholyothin Rd.,
Klong 1, Klong Luang,
Pathumthani 12120 Thailand

Phone : +66 2564 8041
Fax : +66 2564 8042
E-mail: info.th@tuvsud.com
www.tuv-sud.co.th

Regional Head Office:
TÜV SÜD Asia Pacific Pte. Ltd.
15 International Business Park
TUV SUD@ IBP
SINGAPORE 609937



TABLE OF CONTENTS

TEST SUMMARY

PRODUCT DESCRIPTION

SUPPORTING EQUIPMENT DESCRIPTION

EUT OPERATING CONDITIONS

ELECTRICAL FAST TRANSIENT / BURST IMMUNITY
TEST

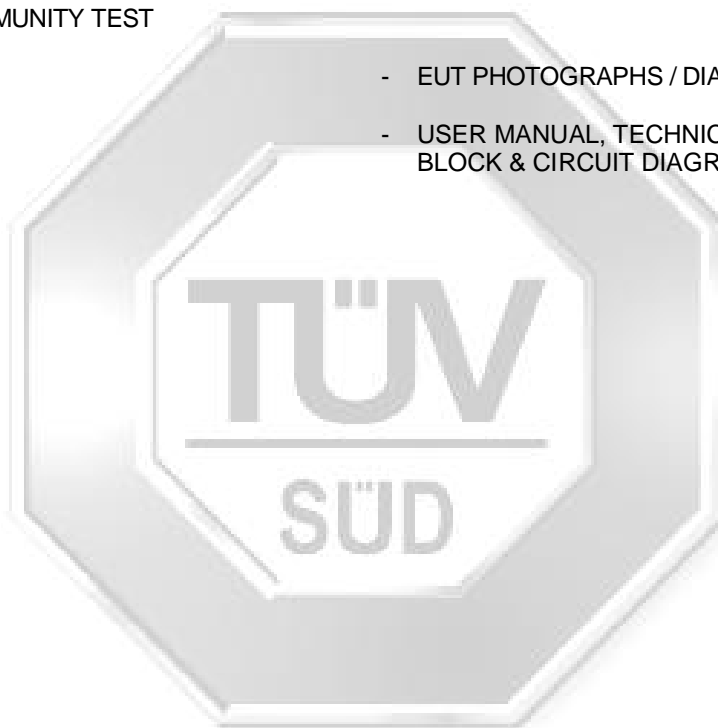
VOLTAGE SURGE IMMUNITY TEST

ANNEX A

- EUT PHOTOGRAPHS / DIAGRAMS

ANNEX B

- USER MANUAL, TECHNICAL DESCRIPTION,
BLOCK & CIRCUIT DIAGRAMS



TEST SUMMARY

The product was tested in accordance with the customer's specifications.

Test Results Summary

Test Standard	Description	Pass / Fail
CISPR 14-2 : 2015 Immunity		
IEC 61000-4-2: 2008	Electrostatic Discharge Immunity	Not tested *See Note 3
IEC 61000-4-3: 2010	RF Radiated Immunity	Not tested *See Note 3
IEC 61000-4-4: 2012	Electrical Fast Transient / Burst Immunity	Pass *See Note 2
IEC 61000-4-5: 2014+A1: 2017	Voltage Surge Immunity	Pass *See Note 2
IEC 61000-4-6: 2013	Conducted Disturbance Immunity	Not tested *See Note 3
IEC 61000-4-11: 2020	Voltage Dips & Interruptions Immunity	Not tested *See Note 3

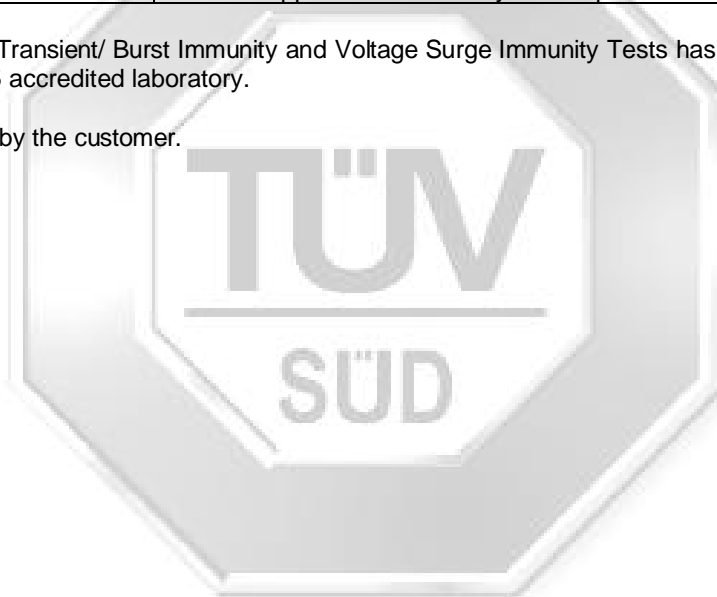
TEST SUMMARY

Notes

1. The Equipment Under Test (EUT) is classified as a Category II device.

Equipment Category	EUT Description
I	Apparatus containing no electronic control circuit.
II	Transformer toys, dual supply toys, mains powered motor operated appliance, tools, heating appliances and similar electric apparatus containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.
III	Battery powered apparatus (with built-in batteries or external batteries) which in normal use is not connected to the mains, containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.
IV	All other apparatus covered by the scope of CISPR 14-2

2. Electrical Fast Transient/ Burst Immunity and Voltage Surge Immunity Tests has been sub-contracted to ISO/IEC 17025 accredited laboratory.
3. Not requested by the customer.



TEST SUMMARY

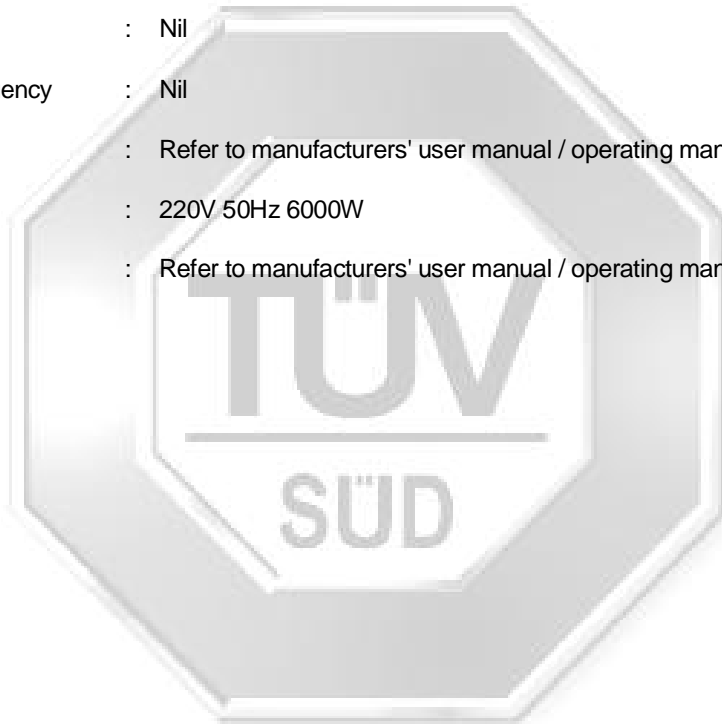
Modifications

No modifications were made.



PRODUCT DESCRIPTION

Description	: The Equipment Under Test (EUT) is an Instantaneous Water Heater (Closed Water Heater) .
Manufacturer	: Rinnai (Thailand) Co., Ltd.
Model Number	: CUBE 6000R
Serial Number	: Nil
Microprocessor	: Nil
Operating Frequency	: Nil
Clock / Oscillator Frequency	: Nil
Port / Connectors	: Refer to manufacturers' user manual / operating manual.
Rated Input Power	: 220V 50Hz 6000W
Accessories	: Refer to manufacturers' user manual / operating manual.



SUPPORTING EQUIPMENT DESCRIPTION

The EUT was tested as a stand-alone unit without any supporting equipment.



EUT OPERATING CONDITIONS

CISPR 14-2

- 1. Electrical Fast Transient / Burst Immunity**
- 2. Voltage Surge Immunity**

The EUT was exercised in its typical operating modes (all possible supported modes) as listed below throughout the test with test condition as specified in the standards:

- a. Mode 1: Normal



ELECTRICAL FAST TRANSIENT / BURST IMMUNITY TEST

IEC 61000-4-4 Electrical Fast Transient / Burst Immunity Test Pass / Fail Criteria

Test: Electrical Fast Transient / Burst Immunity
Performance Criteria: B
PASS Criteria: The EUT shall meet the minimum criteria as specified: a. The EUT shall continue to operate as intended without operator intervention after the test. b. The EUT may show degradation of performance or loss of function during the test, which it must be recoverable to its intended operation after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended. c. The EUT shall show no change of operating mode during and after the test.
FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.
Monitoring Method(s): The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.

IEC 61000-4-4 Electrical Fast Transient / Burst Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
TESEQ Multifunction Generator	NSG 3040	1943	17 May 2022
TESEQ CDN	CDN 3043	2026	17 May 2022

ELECTRICAL FAST TRANSIENT / BURST IMMUNITY TEST

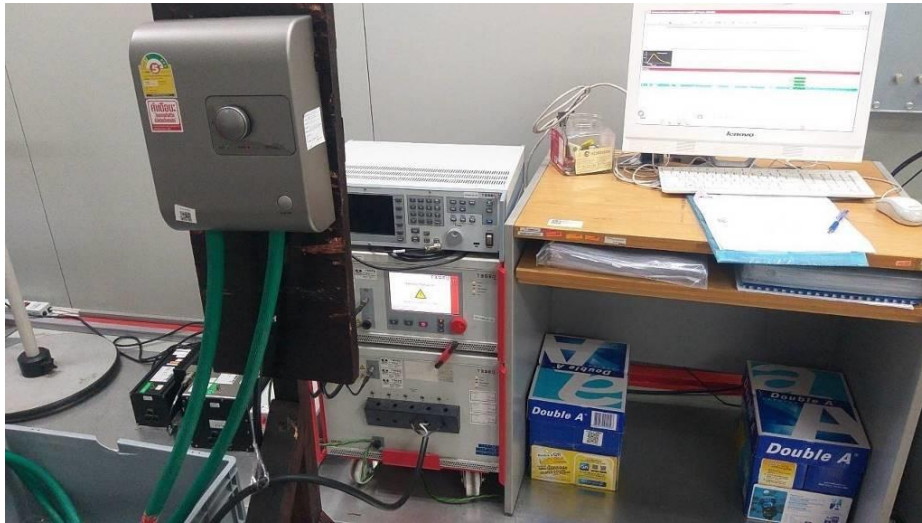
IEC 61000-4-4 Electrical Fast Transient/Burst Immunity Test Setup

1. The test setup was in accordance with the standard.
2. The test was performed using an EFT/B generator and capacitive coupling clamp that were compliant with the standard.
3. The EFT/B generator was placed on top of the ground plane and connected to the protective earth.
4. D.C./A.C. Power Line Test
 - a. The EUT was placed on top of a 0.8m high, non-metallic table, and placed at least 0.5m away from the walls of the room and other conductive surfaces.
 - b. The required power was supplied to the EUT via direct connection to the EFT/B generator.
5. I/O Signal & Control Line Test
 - a. Insulating supports were used to ensure that the EUT and its cables were 0.1m above the metallic ground plane.
 - b. The capacitive coupling clamp was placed on top (and in contact with) the metallic ground plane.
 - c. The Cable Under Test (CUT) was sandwiched between the plates of the capacitive coupling clamp. All other cables were kept as far away from the capacitive coupling clamp as possible, where possible, perpendicularly orientated with respect to the CUT.
 - d. The EFT/B generator output was connected to the capacitive coupling clamp.

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. D.C./A.C. Power Line Test
 - a. The EFT/B test system has a built-in coupling/decoupling network, which couples the generated EFT bursts into the EUT power supply lines connected to it.
 - b. The EFT bursts were coupled to the selected lines (one at a time) of the EUT for the necessary test duration.
3. I/O Signal & Control Line Test
 - a. The interference impulses were capacitively coupled to the EUT's signal cables for the necessary test duration.
 - b. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
 - c. The test was performed with EFT bursts in the positive and negative polarities and repeated on all necessary lines.

ELECTRICAL FAST TRANSIENT / BURST IMMUNITY TEST



Electrical Fast Transient / Burst Immunity Test Setup

ELECTRICAL FAST TRANSIENT / BURST IMMUNITY TEST

IEC 61000-4-4 Electrical Fast Transient / Burst Immunity Results

Model	CUBE 6000R	Temperature	25.0°C
Test Input Power	220V 50Hz	Relative Humidity	52.0%
Operating Mode	Mode 1: Normal	Tested By	Accredited Laboratory
Tested Date	20 Jul 2021		

<u>Cable</u>	<u>Test Severity Level</u>	<u>Results</u>
MAINS LINE		
Live Line	± 1.0kV	Pass
Neutral Line	± 1.0kV	Pass
Earth Line	± 1.0kV	Pass
Live, Neutral & Earth Line	± 1.0kV	Pass
DC, CONTROL & SIGNAL LINES		
Nil	± 0.5kV	Not Applicable *See Note 3

Notes

- Please refer to the Pass/Fail criteria to interpret the results.
- EFT/B Test Details
Waveshape
Repetition Frequency
Test Duration / Level & Polarity
5/50 Tr/Th ns
5kHz
2 minute
- The EUT contains no signal line.

VOLTAGE SURGE IMMUNITY TEST

IEC 61000-4-5 Voltage Surge Immunity Test Pass / Fail Criteria

Test: Voltage Surge Immunity
Performance Criteria: B
PASS Criteria: The EUT shall meet the minimum criteria as specified: a. The EUT shall continue to operate as intended without operator intervention after the test. b. The EUT may show degradation of performance or loss of function during the test, which it must be recoverable to its intended operation after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended. c. The EUT shall show no change of operating mode during and after the test.
FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.
Monitoring Method(s): The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.

IEC 61000-4-5 Voltage Surge Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
TESEQ Multifunction Generator	NSG 3040	1943	17 May 2022
TESEQ CDN	CDN 3043	2026	17 May 2022

VOLTAGE SURGE IMMUNITY TEST

IEC 61000-4-5 Voltage Surge Immunity Test Setup

1. The test setup was in accordance with the standard.
2. The test was performed using a voltage surge generator, mains, and signal line coupling/decoupling networks that were compliant with the standard.
3. The voltage surge generator and coupling/decoupling networks were connected to the same protective earth.
4. The test level was set with the surge generator's HV output open-circuited.
5. For testing of the mains line, the mains coupling/decoupling network was inserted into the line. The voltage surge generator HV output cables were connected to the mains coupling/decoupling network, which has the necessary resistor/capacitor configurations (as required by the standard) built-in. The settings on the mains coupling/decoupling network were selected to give the required resistor/capacitor configuration as follows:
 - a. An 18 μ F capacitor in series with the output of the generator for differential (line-to-line) mode testing.
 - b. A 10 Ω resistor and 9 μ F capacitor in series with the output of the generator for common (line-to-ground) mode testing.

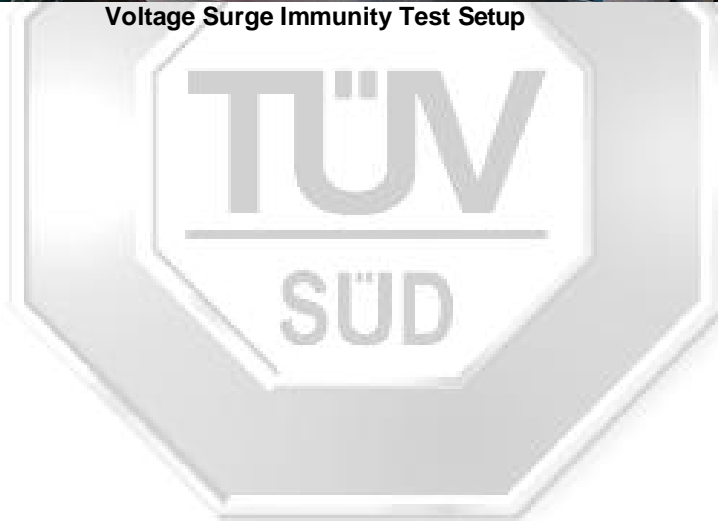
IEC 61000-4-5 Voltage Surge Immunity Test Method

1. The power supply to EUT was switched on and allowed to warm up to its normal operating condition.
2. For a.c. mains lines, the surge was applied at the 90° angle for positive surges and 270° angles for negative surges of the a.c. mains frequency.
3. For d.c. and signal lines, the surge was applied independent from the a.c. mains frequency angle.
4. The correct open-circuit test level was set with the surge generator disconnected from the coupling network.
5. The output of the generator was then reconnected back to the coupling network.
6. Five discharges, generated by the voltage surge generator, and were made on each relevant line, for each polarity, at each test level, with the relevant discharge interval.
7. The EUT was observed during, and checked after the test to determine the result.

VOLTAGE SURGE IMMUNITY TEST



Voltage Surge Immunity Test Setup



VOLTAGE SURGE IMMUNITY TEST

IEC 61000-4-5 Voltage Surge Immunity Results

Model	CUBE 6000R	Temperature	25.0°C
Test Input Power	220V 50Hz	Relative Humidity	51.0%
Operating Mode	Mode 1: Normal	Tested By	Accredited Laboratory
Tested Date	20 Jul 2021		

Cable	Test Severity Level	Results
MAINS LINE		
Neutral - Earth	± 2.0kV	Pass
Live – Earth	± 2.0kV	Pass
Live - Neutral	± 1.0kV	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.

2. Surge Details

Waveshape

No. of Surges / Line, Level &
Polarity
Phase angle

Surge Interval

AC Port

1.2/50 (8/20) Tr/Th µs

5 surges

Positive and negative

90° for positive pulse and 270°
for negative pulse

60 seconds



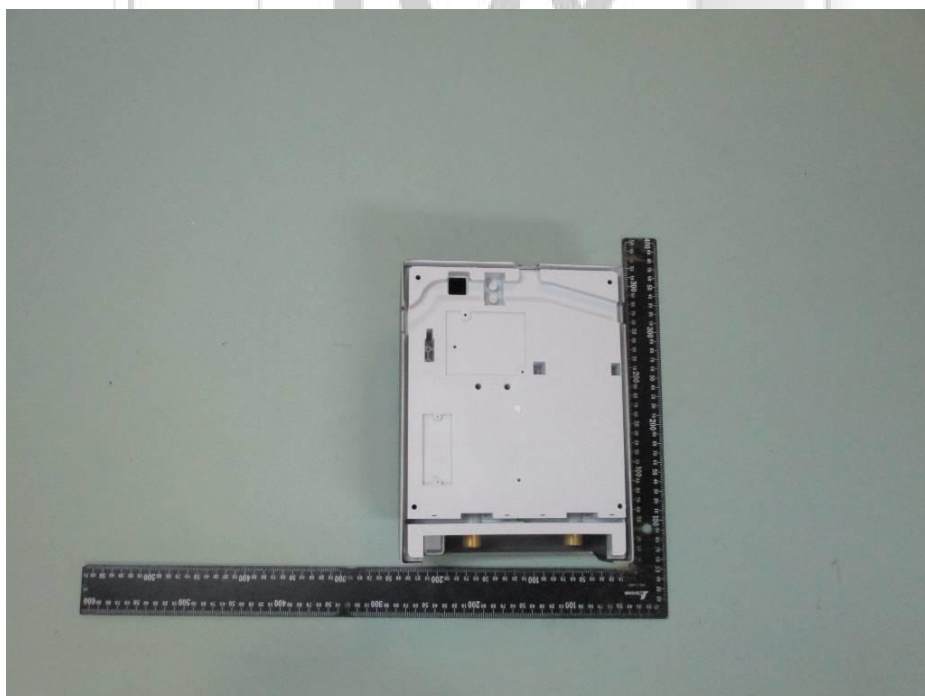
EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS MODEL: CUBE 6000R



Front View

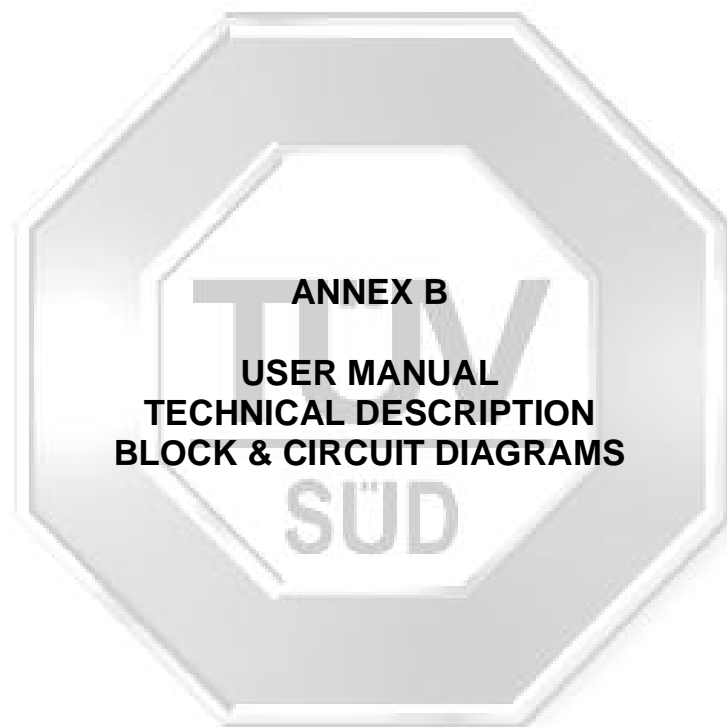


Rear View



**USER MANUAL, TECHNICAL DESCRIPTION, BLOCK
& CIRCUIT DIAGRAMS**

ANNEX B





Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD (Thailand) approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD (Thailand) in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.
2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD (Thailand) therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.
3. Nothing in this report shall be interpreted to mean that TÜV SÜD (Thailand) has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.
4. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD (Thailand) or to the report or results furnished by TÜV SÜD (Thailand) in any advertisements or sales promotion.
5. Unless otherwise stated, the tests were carried out in TÜV SÜD (Thailand) Co., Ltd., Thailand Science Park, 111 Moo 9 Paholyothin Rd., T.Klong Nueng, A.Klong Luang, Pathumthani 12120 Thailand

March 2014

