

## VOC emission test

For floorings following CDPH /EHLB/Standard Method V1.1. California  
Specification 01350

### 1. Manufacturer, product and sample identification

#### Client Information

Client: KDF CO., LTD.  
City/State/Country: 110-3, Sinbong-gil,  
Yeongin-myeon,  
Asan-si,  
Korea  
Contact name: Byoungchul KIM  
Phone number: +82-41-549-0311

#### Manufacturer Information

Manufacturing company: KDF CO., LTD.  
Product name: UNIDECO-Recycled  
Product item No.: KW 5012  
Product category: PVC tile flooring  
Product subcategory: PVC tiles  
Manufacturer ID: --  
Date manufactured: 2013.03.16  
Date collected: 2013.03.19  
Date shipped: 2013.03.20

#### Sample/Specimen Information

Date received: 2013.03.21  
Specimen ID (Lab tracking No.): 00130321422  
Specimen preparation: 4 pieces of specimens of 0.297m by 0.184m were tested with  
back and sides sealed by aluminum foil.  
Conditioning period start & duration: 2013.03.22, 10 days  
Test period start & duration: 2013.04.02, 96 hours

*Except when otherwise approved / licensed by TÜV Rheinland Hong Kong this test report may only be published and used in unabbreviated original phrasing and form. The test report contains the result of one single examination of the individual test sample and does not represent any universally valid evaluation of the qualities of all products from serial production.*

## 2. Test Methods and conditions

### Method

Emission tests are performed following California Department of Public Health Services "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.1 - California Specification 01350". The chamber test method is conducted following the guidance of ASTM Standard D 5116-06 and ISO 16000-9:2011.

### Conditions

The sample was conditioned for 10 days in the same test chamber where the analysis was performed during 96h. The same conditions during conditioning and test were kept and are described in table 1.

Table 1. Chamber conditions during the 10 days conditioning and 96-h test period

Parameter	Symbol	Units	Value
Product exposed area	$A_c$	$m^2$	0.22
Chamber Volume	$V_c$	$m^3$	1
Loading factor	$L_c$	$m^2/m^3$	0.22
Air change rate	$a_c$	$h^{-1}$	0.5
Inlet flow rate	$Q$	$m^3/h$	0.5
Area specific flow rate	$q_A$	$m/h$	2.3
Temperature	$T$	$^{\circ}C$	$23 \pm 1$
Relative humidity	RH	%	$50 \pm 5$

VOC and aldehydes active sampling were performed in duplicate by pumping air through respective sorbent just before loading the chamber, then at 24h, 48h and 96 h after initiating the chamber test (without counting the previous 10 days conditioning). Sampling conditions are represented in Table 2

Table 2. Sampling conditions

Sampling conditions	VOC	Aldehydes (C <sub>1</sub> -C <sub>6</sub> )
Number of sampled tubes	2	2
Sorbent type	Tenax TA	DNPH
Sampling duration	50 min	60 min
Sampling air flow rate	75 mL/min	1.5 mL/min
Sampled air volume	3.8 L	90L

The chemical analysis was performed following internal test methods QMA 36.035.538 HKG and QMA 36.035.524HKG for the analysis of respectively aldehydes in DNPH cartridges by HPLC-UV and VOCs/TVOCs in Tenax tubes by TD-GC-MS. These internal tests methods are based on standards BS ISO 16000-3:2011 and ASTM D5116-10.

### 3. Data Analysis Procedures

#### 3.1 Emission Factors

Emission factors were calculated from chamber concentrations then by using the emission factors the estimated building concentrations were calculated.

Emission factor (EF) in  $\mu\text{g}/\text{m}^2/\text{h}$  for a chemical substance in a chamber test is calculated using Equation 1:

$$EF = (Q (C - C_o)) / A_c \quad (1)$$

where C is the chamber concentration of the substance ( $\mu\text{g}/\text{m}^3$ ) and  $C_o$  is the corresponding substrate or chamber blank concentration ( $\mu\text{g}/\text{m}^3$ ). The other parameters are defined in Table 1.

#### 3.2 Estimated Building Concentrations

Building concentrations can be calculated on a case-by-case basis using input parameters for the amount of installed product, the size of the space and the air change rate (or air flow rate) that are specific to the architectural project under consideration.

In order to evaluate and compare products for use in a wide range of building products, concentrations also can be calculated for selected building scenarios. Building concentrations are estimated based on the measured VOC emission factors, the amount of material to be installed in the building and flow rate of outside air used for ventilation. Steady state conditions with respect to emission rates and building ventilation shall be assumed in making the prediction. Additional assumptions are zero outdoor concentrations, perfect mixing within the building and no net losses of VOC from air due to other effects such as irreversible or net sorption on surfaces (i.e., net sink effects) and chemical reactions. The projected surface area of installed flooring and the building parameters to be used in the calculation of estimated VOC concentrations are established for a school classroom and an office and have been described in table 3.

Table 3. The projected surface area of installed flooring and the building parameters to be used in the calculation of estimated VOC concentrations

Scenario	Outdoor ventilation air ( $\text{m}^3/\text{h}$ )	Exposed flooring surface area ( $\text{m}^2$ )	Area specific air flow rate ( $\text{m}/\text{h}$ )
Standard School Classroom	191	89.2	2.14
Private Office	20.7	11.1	1.86

The estimated building concentration,  $C_{Bi}$  ( $\mu\text{g}/\text{m}^3$ ), of a target VOC is calculated using equation 2.

$$C_{Bi} = (EF \times A_B) / Q_B = EF / (Q_B / A_B) = EF / q_A \quad (2)$$

The area specific emission rate  $EF$  at 336 hours (14 days) total exposure time is divided by the area specific flow rate,  $q_A$  ( $\text{m}/\text{h}$ ). The area specific flow rate,  $q_A$ , is calculated as the ratio of the flow rate of outside ventilation air,  $Q_B$  ( $\text{m}^3/\text{h}$ ), to the exposed surface area of the installed material in the building,  $A_B$  ( $\text{m}^2$ ).

#### 4. Results

Table 4. 24-h and 48-h chamber concentrations and emission factors

Parameter	CAS Number	Chamber concentration ( $\mu\text{g}/\text{m}^3$ )		Emission factor ( $\mu\text{g}/\text{m}^2/\text{h}$ )	
		24h	48h	24h	48h
TVOC	--	38	33	172	150
Formaldehyde	50-00-0	<10	<10	<12	<12

Table 5. 96-h chamber concentrations and emission factors of all target VOCs and most abundant – Only detected compounds have been listed.

Compound Name	CAS Number	Chamber concentration ( $\mu\text{g}/\text{m}^3$ )	Emission factor ( $\mu\text{g}/\text{m}^2/\text{h}$ )	Remark <sup>1</sup>
2-Ethyl-1-hexanol	104-76-7	5	23	
Butyldiglycol	112-34-5	11	49	
2-Butanone	78-93-3	12	53	CRELs / TACs
Ethylacetate	141-78-6	5	22	
TVOC	--	32	145	
Formaldehyde	50-00-0	<10	<12	CRELs / C / TACs

<sup>1</sup> **CRELs** – Chronic Reference Exposure Levels: This substance has a CREL value  
[http://www.oehha.ca.gov/air/chronic\\_rels/AllChrels.html](http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html)).

**C** – Safe Drinking Water and Toxic Enforcement Act of 1986: Classified as known or probable human carcinogens and reproductive/ developmental toxins  
[http://www.oehha.ca.gov/prop65/prop65\\_list/newlist.html](http://www.oehha.ca.gov/prop65/prop65_list/newlist.html)

**TACs** – Toxic Air Contaminants: Classified as Hazardous Air Pollutants plus additional compounds  
<http://www.arb.ca.gov/toxics/id/taclist.htm>

Table 6. Estimated concentrations for the different scenarios and evaluation of the requirements

Compound Name	CAS Number	Allowable Concentration <sup>2</sup> ( $\mu\text{g}/\text{m}^3$ )	Standard class room estimated concentration ( $\mu\text{g}/\text{m}^3$ )	Private office estimated concentration ( $\mu\text{g}/\text{m}^3$ )	Pass/Fail
2-Ethyl-1-hexanol	104-76-7	--	11	12	Pass
Butyldiglycol	112-34-5	--	23	27	Pass
2-Butanone	78-93-3	--	25	28	Pass
Ethylacetate	141-78-6	--	10	12	Pass
TVOC	--	--	68	78	Pass
Formaldehyde	50-00-0	9	<6	<6	Pass

<sup>2</sup> Refer to [http://www.oehha.ca.gov/air/chronic\\_rels/AllChrels.html](http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html). All maximum allowable concentrations are one-half the corresponding CREL adopted by Cal/EPA OEHHA with the exception of formaldehyde.

## 5. Conclusion

The indoor air quality emission criteria for the CDPH Section – 01350 for sample *UNIDECO-Recycled* (Product item No.: KW 5012) have been met for standard class room and private office estimated concentrations.

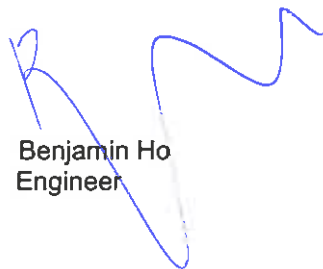
Hong Kong, 2013.04.11

TÜV Rheinland Hong Kong Ltd.



Dr. Wanessa Russeau  
Technical Expert

Person in charge



Benjamin Ho  
Engineer

## Photos



Photo 1. Tested sample – UNIDECO-Recycled (Product item No.: KW 5012) –



Photo 2. Test specimen – UNIDECO-Recycled (Product item No.: KW 5012) –

## Chain of Custody

**VOC emission – Chain of Custody for Sample**  
**Please fill in one form per sample**



**Please ship sample to:**

8-10/F., Goldin Financial Global Square,  
7 Wang Tai Road, Kowloon Bay, Kowloon,  
Hong Kong  
(VOC Emission Testing Lab)

**Please fill in by computer - send with sample, and per email**

Client	Report to be sent to	Invoice to person to	Copy of report to be sent to
Company	KDF CO., LTD.	Korea Testing & Research Institute	sca
Contact person	Byoungchul KIM	Changseok JEONG	RICH MARGOSIAN
E-mail	ikbc77@naver.com	jca@ktr.or.kr	margosian@bendbroadband.com
Address	110-3, Sinbong-gil, Yeongin-myeon, Asan-si	88-2, 8th Yeongdeungpo-dong, Yeongdeungpo-gu	-
Postcode/town	Chungcheongnam-do	Seoul	
Country	Korea	Korea	
Telephone no.	+82-41-549-0311	+82-2-2184-0025	
Fax no.	+82-41-549-0318	+82-2-2634-0067	
Your reference			

**Test Method(s) ordered:**

1. AgBB/DIBt (full test, incl. aldehydes) <input type="checkbox"/>	Without aldehydes test after 28 days <input type="checkbox"/>	AgBB/DIBt (only 7 days) <input type="checkbox"/>	Without aldehydes after 7 days <input type="checkbox"/>	8. LGA Tested Safety & Contamination:	VOC <input type="checkbox"/>	Formaldehyde <input type="checkbox"/>	Odour <input type="checkbox"/>
2. French mandatory VOC label (including 4 regulated CNR) <input type="checkbox"/>	3. CDPH Section 01350 <input checked="" type="checkbox"/>	4. FloorScore <input checked="" type="checkbox"/>	5. ANSI/BIFMA M7.1-2011 <input type="checkbox"/>	9. Formaldehyde:	EN 717-1 <input type="checkbox"/>	ISO 16000-3 (DNPH) <input type="checkbox"/>	ASTM D6007 <input type="checkbox"/>
6. Indoor Air Comfort <input type="checkbox"/>	7. Indoor Air Comfort GOLD <input type="checkbox"/>	10. VOC emission	ISO 16000-6,9 <input type="checkbox"/>	ASTM 5116 <input type="checkbox"/>			

**Further information – Please fill in only if necessary**

Type of Chamber: Mid-scale <input type="checkbox"/> Small-scale <input checked="" type="checkbox"/>	Length of testing: 24h <input type="checkbox"/> 72h <input type="checkbox"/> 168h <input type="checkbox"/> 336h <input type="checkbox"/> Other: _____	Reporting of results: Emission Factors only <input type="checkbox"/> Room concentrations modeling <input type="checkbox"/>
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VOC emission – Chain of Custody for Sample  
 Please fill in one form per sample



<b>Other test/information:</b>			
Report format:	PDF <input type="checkbox"/>	Printed <input type="checkbox"/>	Printed & PDF <input checked="" type="checkbox"/>

Product Commercial Name:	UNIDECO- Recycled	Product Commercial Part No.:	KW 5012
Product Dimensions: (height x width x thickness)	184 * 950 * 3.0 (WEAR LAYER 0.1mm)	Product Item No.:	KW 5012
Manufacturer Sample Tracking ID:	2013.3.16	Date Manufactured:	2013.3.16
Product Category and Use:	PVC TILE	Sample Construction Material:	
Plant Name & Location:	KDF CO., LTD.	Collection Location in Plant:	WARE HOUSE
Date and Time of collection:	2013.3.19	Sample Collected by:	MARGOSIAN, RICH
Storage of Sample after Sampling:	24HOURS	Packing Material:	2013.3.19
Packed and Shipped by:	Mr. Lim	Shipping Date:	2013.3.20
Carrier:	UPS	Airbill Number:	1212049A0490747649

<b>FOR LABORATORY USE ONLY</b>			
Received by:	Lim	Received date:	2013.03.21
Conditions of package:	OK	Conditions of Sample:	OK
Received by:	Lim	Signature:	Lim
Company:	TUV Rheinland HK	Laboratory:	VOC Lab
Sample Number:	00130321422	Report Number:	143246399/Voc/01



## General Terms and Conditions of Business of TÜV Rheinland in Greater China

### 1. Scope

1.1 These General Terms and Conditions of Business of TÜV Rheinland in Greater China is made between the client and one or more member entities of TÜV Rheinland in Greater China as applicable as the case may be ("TÜV Rheinland").

1.2 The following terms and conditions apply to agreed services including consultancy services, information, deliveries and similar services as well as ancillary services and other secondary obligations provided within the scope of contract performance.

1.3 Any standard terms and conditions of the client of any nature shall not apply and shall hereby be expressly excluded. No standard contractual terms and conditions of the client shall form part of the contract even if TÜV Rheinland does not explicitly object to them.

### 2. Quotations

Unless otherwise agreed, all quotations submitted by TÜV Rheinland can be changed by TÜV Rheinland without notice prior to its acceptance and confirmation by the other party.

### 3. Coming into effect and duration of contracts

3.1 The contract shall come into effect for the agreed terms upon the quotation letter of TÜV Rheinland or a separate contractual document being signed by both contracting parties, or upon the works requested by the client being carried out by TÜV Rheinland. If the client instructs TÜV Rheinland without receiving a quotation from TÜV Rheinland (quotation), TÜV Rheinland is, in its sole discretion, entitled to accept the order by giving written notice of such acceptance (including notice sent via electronic means) or by performing the requested services.

3.2 The contract term starts upon the coming into effect of the contract in accordance with article 3.1 and shall continue for the term agreed in the contract.

3.3 If the contract provides for an extension of the contract term, the contract term will be extended by the term provided for in the contract unless terminated in writing by either party with a six-week notice prior to the end of the contractual term.

### 4. Scope of services

4.1 The scope of the services shall be decided solely by a unanimous declaration issued by both parties. If no such declaration exists, then the written confirmation of order by TÜV Rheinland shall be decisive.

4.2 The agreed services shall be performed in compliance with the regulations in force at the time the contract is entered into.

4.3 TÜV Rheinland is entitled to determine, in its sole discretion, the method and nature of the assessment unless otherwise agreed in writing or if mandatory provisions require a specific procedure to be followed.

4.4 On execution of the work there shall be no simultaneous assumption of any guarantee of the correctness (proper quality) and working order of either tested or examined parts nor of the installation as a whole and its upstream and/or downstream processes, organisations, use and application in accordance with regulations, nor of the systems on which the installation is based. In particular, TÜV Rheinland shall assume no responsibility for the construction, selection of materials and assembly of installations examined, nor for their use and application in accordance with regulations unless these questions are expressly covered by the contract.

4.5 In the case of inspection work, TÜV Rheinland shall not be responsible for the accuracy or checking of the safety programmes or safety regulations on which the inspections are based, unless otherwise expressly agreed in writing.

### 5. Performance periods/dates

5.1 The contractually agreed periods/dates of performance are based on estimates of the work involved which are prepared in line with the details provided by the client. They shall only be binding if being confirmed as binding by TÜV Rheinland in writing.

5.2 If binding periods of performance have been agreed, these periods shall not commence until the client has submitted all required documents to TÜV Rheinland.

5.3 Articles 5.1 and 5.2 also apply, even without express approval by the client, to all extensions of agreed periods/dates of performance not caused by TÜV Rheinland.

### 6. The client's obligation to cooperate

6.1 The client shall guarantee that all cooperation required on its part, its agents or third parties will be provided in good time and at no cost to TÜV Rheinland.

6.2 Design documents, supplies, auxiliary staff, etc. necessary for performance of the services shall be made available free of charge by the client. Moreover, collaborative action of the client must be undertaken in accordance with legal provisions, standards, safety regulations and accident prevention instructions.

6.3 The client shall bear any additional cost incurred on account of work having to be redone or being delayed as a result of late, incorrect or incomplete information provided by or lack of proper cooperation from the client. Even where a fixed or maximum price is agreed, TÜV Rheinland shall be entitled to charge extra fees for such additional expense.

### 7. Invoicing of work

7.1 If the scope of performance is not laid down in writing when the order is placed, invoicing shall be based on costs actually incurred. If no price is agreed in writing, invoicing shall be made in accordance with the price list of TÜV Rheinland valid at the time of performance.

7.2 Unless otherwise agreed, work shall be invoiced according to the progress of the work.

7.3 If the execution of an order extends over more than one month and the value of the contract or the agreed fixed price exceeds €2,500.00 or equivalent value in local currency, TÜV Rheinland may demand payments on account or in instalments.

## 8. Payment terms

8.1 All invoice amounts shall be due for payment without deduction on receipt of the invoice. No discounts shall be granted.

8.2 Payments shall be made to the bank account of TÜV Rheinland as indicated on the invoice, stating the invoice and customer numbers.

8.3 In cases of default of payment, TÜV Rheinland shall be entitled to claim default interest at the applicable short term loan interest rate publicly announced by a reputable commercial bank in the country where TÜV Rheinland is located. At the same time, TÜV Rheinland reserves the right to claim further damages.

8.4 Should the client default in payment of the invoice despite being granted a reasonable grace period, TÜV Rheinland shall be entitled to cancel the contract, withdraw the certificate, claim damages for non-performance and refuse to continue performance of the contract.

8.5 The provisions set forth in article 8.4 shall also apply in cases involving returned cheques, cessation of payment, commencement of insolvency proceedings

against the client's assets or cases in which the commencement of insolvency proceedings has been dismissed due to lack of assets.

8.6 Objections to the invoices of TÜV Rheinland shall be submitted in writing within two weeks of receipt of the invoice.

8.7 TÜV Rheinland shall be entitled to demand appropriate advance payments.

8.8 TÜV Rheinland shall be entitled to raise its fees at the beginning of a month if overheads and/or purchase costs have increased. In this case, TÜV Rheinland shall notify the client in writing of the rise in fees. This notification shall be issued one month prior to the date on which the rise in fees shall come into effect (period of notice of changes in fees). If the rise in fees remains under 5% per contractual year, the client shall not have the right to terminate the contract. If the rise in fees exceeds 5% per contractual year, the client shall be entitled to terminate the contract by the end of the period of notice of changes in fees. If the contract is not terminated, the changed fees shall be deemed to have been agreed upon by the time of the expiry of the notice period.

8.9 Only legally established and undisputed claims may be offset against claims by TÜV Rheinland.

## 9. Acceptance

9.1 Any part of the work ordered which is complete in itself may be presented by TÜV Rheinland for acceptance as an instalment. The client shall be obliged to accept it immediately.

9.2 If the client fails to fulfil its acceptance obligation immediately, acceptance shall be deemed to have taken place 4 calendar weeks after completion of the work provided that TÜV Rheinland has specifically made the client aware of the

above-mentioned deadline upon completion of the work.

## 10. Confidentiality

10.1 For the purpose of these terms and conditions, "confidential information" means all information, documents, images, drawings, know-how, data, samples and project documentation which one party (the "disclosing party") hands over, transfers or otherwise discloses to the other party (the "receiving party"). Confidential information also includes paper copies and electronic copies of such information.

10.2 The disclosing party shall mark all confidential information disclosed in written form as confidential before passing it onto the receiving party. The same applies to confidential information transmitted by e-mail. If confidential information is disclosed orally, the receiving party shall be appropriately informed in advance and the disclosing party shall confirm in writing the confidentiality nature of the information within five working days of oral disclosure. Where the disclosing party fails to do so within the stipulated period, the receiving party shall not take any confidentiality obligations hereunder towards such information.

10.3 All confidential information which the disclosing party transmits or otherwise discloses to the receiving party during performance of work by TÜV Rheinland:

- may only be used by the receiving party for the purposes of performing the contract, unless expressly otherwise agreed in writing by the disclosing party;
- may not be copied, distributed, published or otherwise disclosed by the receiving party, unless this is necessary for fulfilling the purpose of the contract or TÜV Rheinland is required

- to pass on confidential information, inspection reports or documentation to the government authorities, judicial court, accreditation bodies or third parties that are involved in the performance of the contract;
- c) must be treated by the receiving party with the same level of confidentiality as the receiving party uses to protect its own confidential information, but never with a lesser level of confidentiality than that which is reasonably required.
- 10.4 The receiving party may disclose any confidential information received from the disclosing party only to those of its employees who need this information to perform the services required for the contract. The receiving party undertakes to oblige these employees to observe the same level of secrecy as set forth in this confidentiality clause.
- 10.5 Information for which the receiving party can furnish proof that:
- it was generally known at the time of disclosure or has become general knowledge without violation of this confidentiality clause by the receiving party; or
  - it was disclosed to the receiving party by a third party entitled to disclose this information; or
  - the receiving party already possessed this information prior to disclosure by the disclosing party; or
  - the receiving party developed it itself, irrespective of disclosure by the disclosing party, shall not be deemed to constitute "confidential information" as defined in this confidentiality clause.
- 10.6 All confidential information shall remain the property of the disclosing party. The receiving party hereby agrees to immediately (i) return all confidential information, including all copies, to the disclosing party, and/or (ii) on request by the disclosing party, to destroy all confidential information, including all copies, and confirm the destruction of this confidential information to the disclosing party in writing, at any time if so requested by the disclosing party but at the latest and without special request after termination or expiry of the contract. This does not extend to include reports and certificates prepared for the client solely for the purpose of fulfilling the obligations under the contract, which shall remain with the client. However, TÜV Rheinland is entitled to make file copies of such reports, certificates and confidential information that forms the basis for preparing these reports and certificates in order to evidence the correctness of its results and for general documentation purposes required by laws, regulations and the requirements of working procedures of TÜV Rheinland.
- 10.7 From the start of the contract and for a period of three years after termination or expiry of the contract, the receiving party shall maintain strict secrecy of all confidential information and shall not disclose this information to any third parties or use it for itself.
- 11. Copyrights**
- 11.1 TÜV Rheinland shall retain all exclusive copyrights in the expert reports, test results, calculations, presentations etc. prepared by TÜV Rheinland.
- 11.2 The client may only use such expert reports, test results, calculations, presentations etc. prepared within the scope of the contract for the contractually agreed purpose.
- 11.3 The client may use test reports, test results, expert reports, etc. only complete and unshortened. Any publication or duplication for advertising purposes needs the prior written approval of TÜV Rheinland.
- 12. Liability of TÜV Rheinland**
- 12.1. Irrespective of the legal basis, in the event of a breach of contractual obligations or tort, the liability of TÜV Rheinland for all damages, losses and reimbursement of expenses caused by TÜV Rheinland, its legal representatives and/or employees shall be limited to: (i) in the case of a contract with a fixed overall fee, three times the overall fee for the entire contract; (ii) in the case of a contract for annually recurring services, the agreed annual fee; (iii) in the case of a contract expressly charged on a time and material basis, a maximum of 20,000 Euro or equivalent amount in local currency; and (iv) in the case of a framework agreement that provides for the possibility of placing individual orders, three times of the fee for the individual order under which the damages or losses have occurred. Notwithstanding the above, in the event that the total and accumulated liability calculated according to the foregoing provisions exceeds 2.5 Million Euro or equivalent amount in local currency, the total and accumulated liability of TÜV Rheinland shall be only limited to and shall not exceed the said 2.5 Million Euro or equivalent amount in local currency.
- 12.2 The limitation of liability according to article 12.1 above shall not apply to damages and/or losses caused by malice, intent or gross negligence on the part of TÜV Rheinland or its vicarious agents. Such limitation shall not apply to

damages for a person's death, physical injury or illness.

12.3 In cases involving a fundamental breach of contract, TÜV Rheinland will be liable even where minor negligence is involved. For this purpose, a "fundamental breach" is breach of a material contractual obligation, the performance of which permits the due performance of the contract. Any claim for damages for a fundamental breach of contract shall be limited to the amount of damages reasonably foreseen as a possible consequence of such breach of contract at the time of the breach (reasonably foreseeable damages), unless any of the circumstances described in article 12.2 applies.

12.4 TÜV Rheinland shall not be liable for the acts of the personnel made available by the client to support TÜV Rheinland in the performance of its services under the contract, unless such personnel made available is regarded as vicarious agent of TÜV Rheinland. If TÜV Rheinland is not liable for the acts of the personnel made available by the client under the foregoing provision, the client shall indemnify TÜV Rheinland against any claims made by third parties arising from or in connection with such personnel's acts.

12.5 The limitation periods for claims for damages shall be based on statutory provisions.

12.6 None of the provisions of this article 12 changes the burden of proof to the disadvantage of the client.

### 13. Partial invalidity, written form, place of jurisdiction and dispute resolution

13.1 All amendments and supplements must be in writing in order to be effective. This also applies to amendments and supplements to this clause 13.1.

13.2 Should one or several of the provisions under the contract and/or these terms and conditions be or become ineffective, the contracting parties shall replace the invalid provision with a legally valid provision that comes closest to the content of the invalid provision in legal and commercial terms.

13.4 Unless otherwise stipulated in the contract, the governing law of the contract and these terms and conditions shall be chosen following the rules as below:

a) if TÜV Rheinland in question is legally registered and existing in the People's Republic of China, the contracting parties hereby agree that the contract and these terms and conditions shall be governed by the laws of the People's Republic of China.

b) if TÜV Rheinland in question is legally registered and existing in the Republic of China, the contracting parties hereby agree that the contract and these terms and conditions shall be governed by the laws of the Republic of China.

c) if TÜV Rheinland in question is legally registered and existing in Hong Kong, the contracting parties hereby agree that the contract and these terms and conditions shall be governed by the laws of Hong Kong.

13.5 Any dispute in connection with the contract and these

terms and conditions or the execution thereof shall be settled friendly through negotiations.

Unless otherwise stipulated in the contract, if no settlement or no agreement in respect of the extension of the negotiation period can be reached within two months of the arising of the dispute, the dispute shall be submitted:

a) in the case of TÜV Rheinland in question being legally registered and existing in the People's Republic of China, to China International Economic and Trade Arbitration Commission (CIETAC) to be settled by arbitration under the Arbitration Rules of CIETAC in force when the arbitration is submitted. The arbitration shall take place in Beijing, Shanghai, Shenzhen or Chongqing as appropriately chosen by the claiming party.

b) in the case of TÜV Rheinland in question being legally registered and existing in the Republic of China, to Chinese Arbitration Association Taipei Branch to be arbitrated in accordance with its then current Rules of Arbitration. The arbitration shall take place in Taipei.

c) in the case of TÜV Rheinland being legally registered and existing in Hong Kong, to Hong Kong International Arbitration Centre (HKIAC) to be settled by arbitration under the HKIAC Administered Arbitration Rules in force when the Notice of Arbitration is submitted in accordance with these rules. The arbitration shall take place in Hong Kong.

The decision of the relevant arbitration tribunal shall be final and binding on both parties. The arbitration fee shall be borne by the losing party.