



**Hong Kong Association for  
Testing, Inspection and Certification Ltd.  
Professional Certification Scheme for Testing Personnel**

**CC03  
CERTIFICATION HANDBOOK  
ELECTRICAL PRODUCTS TESTING**

First Issue  
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## FOREWORD

The Professional Certification Scheme for Testing Personnel (PCSTP) is a comprehensive scheme which provides for the examination and certification of individuals seeking to demonstrate their knowledge and/or competence in their field of operation.

The scheme is developed under HKTIC and managed by the Certification Board (CB), which is responsible for the granting, reviewing and revising the personnel certification titles and requirements in accordance to the prevailing demand of the testing industries served by the scheme. The Certification Board, in turn, may appoint specialist Working Committees as it deems necessary to oversee specific parts of the scheme.

The sole criteria for certification of personnel engaged in electrical products testing are given in this document (and any subsequent amendments) and no other criteria will be applied. Certification is not conditional on the candidate applying for other services or membership from HKTIC or any other groups or associations.

The benefits of certification include:

1. recognition and prestige for the individual and creation of a competitive advantage over non-certified individuals in the same field;
2. enhanced employment opportunities;
3. establishment of a professional standard for individuals in a particular testing field;
4. assistance to employers in making more informed recruitment decisions;
5. a more productive and highly trained workforce for employers;
6. enhanced professional impression on customers;
7. assistance to clients in making informed decisions about qualified providers;
8. protection of the general public from using incompetent and unfit practitioners; and
9. assurance of the general public of the accuracy and validity of testing results.



## **Requirements of Certification of Personnel Engaged in Electrical Products Testing**

### **1. General**

- 1.1. This document prescribes procedures by which personnel may be examined and, if successful, certified for electrical products testing.

### **2. Scope of Certification**

- 2.1. The levels of certification available are

- 2.1.1. Certified Testing Technician and;
- 2.1.2. Certified Testing Professional.

- 2.2. The scope of certification

Certification of electrical products testing is sub-divided into three sub-categories:

- 2.2.1. Safety tests;
- 2.2.2. Electromagnetic compatibility tests; and
- 2.2.3. Green tests;

### **3. Eligibility for certification**

- 3.1. Candidates shall have a combination of education, training and experience adequate to ensure that they have the potential to understand the principles and procedures of the applicable methods.

- 3.2. Academic qualification and experience

- 3.2.1. Certified Testing Technician (CTT)

- (a) The candidate shall have

- a diploma in science or engineering or equivalent with no less than two years of relevant testing experience; or
- 10 years of relevant testing experience; or
- any other qualifications and experience deemed as equivalent.

- 3.2.2. Certified Testing Professional (CTP)

- (a) The candidate shall have a bachelor's degree in science or engineering or equivalent and with no less than three years of relevant experience.



- (b) Candidate without a degree shall
  - have been certified as Certified Testing Technician by the Certification Board and have no less than five years of relevant supervisory experience post certification as CTT, or
  - have no less than 15 years of relevant experience of which 5 years shall be at a managerial position.
- (c) Candidates shall have any other qualifications and experience deemed as equivalent.

### 3.3. Training

#### 3.3.1. Certified Testing technician

- (a) provide certificates of achievement (satisfactory results in end-of-course evaluation) in training courses approved by the Certification Board in respective competence requirements; or
- (b) obtain satisfactory results in certification examinations as arranged by the Certification Board.

Details of approved training courses are available on [www.hktic.org](http://www.hktic.org).

#### 3.3.2. Certified Testing Professional

- (a) any one of the following:
  - (i) provide certificates of achievement (satisfactory results in end-of-course evaluation) in training courses approved by the Certification Board in respective competence requirements; or
  - (ii) obtain satisfactory results in certification scheme examinations as arranged by the Certification Board; or
  - (iii) have no less than 15 years of relevant experience, of which 5 years shall be at managerial position; or
  - (iv) HOKLAS approved signatory with not less than 8 years of relevant experience and the scope of signatory approval covering the major measurement techniques or methods as stipulated in this Certification



Handbook for the sub-category the certification is being sought; and |

(b) obtain satisfactory results in professional assessment by interview.

Details of approved training courses are available on [www.hktic.org](http://www.hktic.org).

### 3.4. Competence requirements for Certified Testing Technician

#### 3.4.1. General requirements

- Understanding of ISO/IEC 17025
- Laboratory safety
- Integrity management

#### 3.4.2. Technical requirements

- Understanding basic laboratory techniques
- Knowledge of equipment usage

### 3.5. Competence requirements for Certified Testing Professional

#### 3.5.1. Management requirements

- Management skills
- Integrity management

#### 3.5.2. Quality requirements

- Laboratory management in compliance with ISO/IEC 17025
  - Statistical treatments of data and quality control requirement
- Laboratory safety

#### 3.5.3. Technical requirements

- Estimations of measurement uncertainty
- Interpretation of results and reporting requirements
- Requirements of equipment calibration
- Principles of laboratory techniques employed in testing



#### **4. Examination Procedure**

4.1. A candidate who can provide certificates of achievement in training courses in all competence requirements may be exempted from examinations.

4.2. Partial exemption for examinations is not allowed.

4.3. No exemption is permitted for professional assessment by interview for Certified Testing Professional candidates.

4.4. Examinations consists of

4.4.1. Written examination; and/or

4.4.2. Professional assessment by interview (for Certified Testing Professionals only).

4.5. Candidates must satisfy the examiner(s) in all parts. Details of the examination format follow the syllabus and specimen examination questions as given in Appendices 1 and 2 respectively.

4.6. Types of questions

4.6.1. Multiple choice questions

4.6.2. Short answer questions

4.6.3. Open-ended questions

4.7. Examination for Certified Testing Technician

The examination will comprise the following:

4.7.1. General

- multiple-choice questions
- short answer questions

4.7.2. Technical

- multiple-choice questions
- short answer questions

4.7.3. Time length of examination

- Written examination – 2 hours



#### 4.7.4. Weighting of each topic

<u>Topics</u>	<u>Weighting (%)</u>
a) Understanding ISO/IEC 17025	10
b) Laboratory safety	10
c) Integrity management	10
d) Understanding basic laboratory techniques	45
e) Equipment usage	25

Weighting of each topic shall not deviate from the pre-set percentage by more than 5%.

#### 4.7.5. Marking system

- Model answer shall be set for each multiple choice questions. Marks will be given for correct answers and half of the mark will be deducted for each wrong answer.
- Suggested answers shall be set and marks should be allocated according to key points of answers for short questions. Marks for each key point should be pre-set. Marks would be given to answers with meanings which match the suggested answers as judged by the marker.

#### 4.7.6. Passing mark

- The passing mark for each section shall not be less than 40% and the overall passing mark is 60%.

#### 4.8. Examination for Certified Testing Professional

The examination will comprise the following:

##### 4.8.1. Management requirements

- Multiple choice questions
- Short answer questions

##### 4.8.2. Quality requirements

- Multiple choice questions
- Short answer questions



- Open-ended question(s)

#### 4.8.3. Technical requirements

- Multiple choice questions
- Short questions
- Open-ended question(s)

#### 4.8.4. Professional assessment by interview

- The interview will cover all certification criteria and focus on underlying principles, limitations, quality control checks and reporting requirements of tests currently undertaken by the candidate.

#### 4.8.5. Time length of examinations

- Written examination – 3 hours
- Professional assessment by interview – 30 to 50 minutes

#### 4.8.6. Weighting for each topic

<u>Topics</u>	<u>Weighting (%)</u>
a) Management requirements	10
b) Integrity management	10
c) Laboratory management in compliance with ISO/IEC 17025	15
d) Laboratory safety	5
e) Estimation of measurement uncertainty	10
f) Interpretation of results and reporting requirements	10
g) Requirements of equipment calibration	15
h) Principles of measurement methods	25

Weighting of each topic shall not deviate from the pre-set percentage by more than 5%.

#### 4.8.7. Marking system

- The same marking system as Section 4.7.5 shall apply. The marking system for open-ended questions shall be the same as that for short questions.



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#### 4.8.8. Passing Mark

- The passing mark for each section shall not be less than 40% and the overall passing mark is 60% for each of the written examination and of the interview.
- A candidate must pass both the written examination and the interview.



## 5. Application Procedure for Certification/Examination and Fees

### 5.1. Application form

5.1.1. Applications must be made on the appropriate application form which is available at [www.hktic.org](http://www.hktic.org).

5.1.2. Application form asks for specific details of experience and training and must be signed confirming that these details are correct and supported by such other documents as may be necessary to confirm that the candidate is eligible for examination.

5.1.3. No applications can be confirmed or examination dates issued until receipt of a correctly completed application form and the full fees. In the event of false statements being discovered any certificate awarded as a result of the test will be revoked and declared null and void.

### 5.2. Application and examination fees

5.2.1. The fee structure is as follows:

Level	Type of application/examination	Fee (H.K. \$)
CTT	Initial and upgrade application	300
	Examination (written), if applicable <sup>Note</sup>	500
	Annual subscription fee	500
CTP	Initial and upgrade application	500
	Examination (written), if applicable <sup>Note</sup>	500
	Examination (professional assessment)	1000
	Annual subscription fee	500

Note:

Written examination can be exempted under the following conditions by:

- achieving certificate of achievement (satisfactory results in end-of-course evaluation) in approved training courses for all competence requirements; or
- fulfilling the academic requirements and having no less than 15 years of relevant experience, of which 5 years shall be at a managerial position for testing professionals.



5.3. Initial certification, certification upgrade and extension of certification of new category

5.3.1. Candidates who are seeking certification for the first time or for those wishing to upgrade or extend their certification credential can go to website [www.hktic.org](http://www.hktic.org) and download an application form and Handbook for the test category to be certified.

5.3.2. The candidate shall submit payment, completed application form and documentation consisting of :

- Academic qualifications;
- Certificate of achievements in appropriate training courses; and
- Any other relevant records

5.3.3. The application is reviewed and evaluated by the Programme Officer for confirmation of acceptance at the requested level of certification. The candidate is notified of the decision and/or date and time of examination where applicable.

5.3.4. The Certification Board may grant certification to Testing Technicians directly without examination on condition that they fulfill the academic and training criteria as stipulated in clauses 3.2.1 and 3.3.1.

5.3.5. The Certification Board may recommend that a candidate seeks certification at an alternate level, or terminate the certification process after reviewing the documents submitted. The application fee would not be refunded.

5.3.6. The examiners involved are independent and do not respond to questions from candidate. The Programme Officer provides the information about the certification process to the candidate and answers any questions he/she may have.

5.3.7. The Certification Board makes the decisions on awarding a pass or fail based primarily upon the recommendation of the examiners.

5.3.8. A candidate applying for Certified Testing Professional is advised to take and pass the written examination before applying for professional assessment by interview.

5.3.9. All certified personnel will be registered in databases and presented as public information on their respective websites. The candidate is notified of the result of the



certification procedure within 30 calendar days after the examination or submission of application. They are entitled to use the designation as CTP or CTT.

#### 5.4. Re-certification

5.4.1. Candidates are required to re-certify after the period of certification validity, which is normally 3 years from the date of issue of the certificate, has expired.

5.4.2. The re-certification process is different from the first certification process. It concentrates on the continuing professional development (CPD) of the individual that has taken part in since the last certification or re-certification. Similar to first certification, candidate shall visit the website and download the application form and shall submit payment and completed documentation, consisting of

- Application form for re-certification
- Working experience in the past 3 years and
- Records of Continuing Professional Development (form for recording of CPDU is available on website [www.hktic.org](http://www.hktic.org))

5.4.3. The Programme Secretariat will review the records of CPD to determine whether the re-certification candidate fulfils the CPD requirements for his/her level.

#### 5.5. Continuing Professional Development (CPD)

5.5.1. The Continuing Professional Development programme supports the ongoing educational and professional development of individuals who have attained the certification. The purpose of the CPD program is to:

- enhance ongoing professional development;
- encourage and recognize individualized learning opportunities;
- maintain the value and recognition of the certification; and
- provide a vehicle for attaining and recording professional development activities.

5.5.2. In order to satisfy the CPD programme and maintain an active certification status, candidate must accrue and report a minimum of 30 and 60 Continuing Professional Development Units (CPDUs) during each three-year certification cycle for Certified Testing Technician and Certified Testing Professional respectively. A Certified Testing Technician can accrue the necessary CPDUs by participating in any one or more activities as listed in Appendix 4. A Certified Testing Professional shall



participate in at least two activities. The number of CPDUs accrued for one activity shall not be less than 30 in case the Professional attends only two activities. The expiry date of validity is shown on the certificate.

#### 5.5.3. Continuing Professional Development Units (CPDUs)

- The Continuing Professional Development Units (CPDUs) is the measuring unit used to quantify approved learning and professional service activities. Typically, one CPDU is earned for every one hour spent in a planned, structured learning experience or activity. There is a range of opportunities available to candidates to acquire CPDUs through training/education programmes and professional activities covering seminar, industrial discussion group, symposium, training course, etc. Appendix 4 gives guidelines for counting CPDUs.

#### 5.6. Cancellations, Rescheduling, No Shows

- 5.6.1. If candidate needs to cancel or reschedule an interview or an examination, he/she must do so no later than 48 hours before the scheduled appointment.
- 5.6.2. If he/she fails to notify the appropriate party within the specified time period and/or fails to meet a scheduled examination appointment, he/she forfeits the full certification fee and will have to pay the full certification fee in order to schedule another interview or examination.
- 5.6.3. There are times when extenuating circumstances (e.g. medical emergency, death in immediate family, illness in immediate family) may prevent a candidate from meeting a scheduled interview or examination appointment, resulting in a no show. Should such a situation arise, the candidate will be asked to provide explanations along with supporting documentation (e.g. accident report, medical documentation, death certificate). If he/she does not make contact within 72 hours following a missed appointment, fees will apply in order to schedule a new appointment. All claims will be reviewed on a case-by-case basis. The candidate is allowed a maximum of one year, from the date of application is approved, to apply for re-examination.



## 6. Appeals

6.1. As a policy, the Certification Board has a procedure for considering appeals against the decisions at the end of each stage of the certification cycle.

### 6.2. Written examination recheck

6.2.1. The marks awarded for a particular section may be subject to a recheck. A recheck is carried out to ensure that there have been no arithmetical or clerical errors, that the marks awarded are appropriate and that all the marks to which the candidate is entitled have been included in the final total.

### 6.3. Professional assessment Review

6.3.1. The grounds for such review must clearly identify the element or elements of the assessment for which the review is sought. It must also specify the grounds on which the review is sought and must contain all information, which the candidate requests to be taken into account in the review.

6.3.2. The grounds for a review are:

- The regulations have not been properly implemented.
- The regulations do not adequately cover the candidate's case.
- Compassionate or medical circumstances related to the candidate's assessment situation, which were made known by the candidate in writing.
- Significant performance related information which the candidate believes was not considered by the examiners.

### 6.4. Appeal for a written examination recheck

6.4.1. A request for a recheck must be received no later than 10 working days after the date of posting of the examination results.

6.4.2. Only a written request for a recheck will be considered.

6.4.3. A fee, as stipulated in the Schedule of Fees, will be charged, which must be included in the request for a recheck. The fee is non-refundable.

### 6.5. Appeal for a professional assessment review

6.5.1. A request for a review must be received no later than 10 working days after the date of posting of the assessment results.



- 6.5.2. Only a written request will be considered.
- 6.5.3. As the result of the appeal needs to be ratified by the Certification Board, it may take some time before the candidate is notified of the decision.
- 6.5.4. The fee for the professional assessment review is as set forth in the Schedule of Fees. Such fee is non-refundable.
- 6.6. An appeal form for appeal of written examination and professional assessment is available on website [www.hktic.org](http://www.hktic.org).



## 7. **Obligations**

7.1. All certified personnel shall at all times:-

7.1.1. commit to abide with the Regulations as set for the PCSTP scheme;

7.1.2. pay the fees and charges as determined by the Certification Board;

7.1.3. represent honestly and truthfully to any person concerned that he/she is only certified for activities stated in the scope of certification;

7.1.4. endeavour to ensure that the certification granted by the Certification Board is not used in a misleading manner; and

7.1.5. maintain complete integrity and impartiality in all circumstances.

7.2. Details of regulations are given in the document PCSTP01 “Regulations for Professional Certification Scheme for Testing Personnel”.



## APPENDIX 1:

### **Examination syllabus and specimen questions for Certified Testing Technician**

Any aspect of the syllabus may be included in the written examinations or professional assessments. The level of knowledge required by the candidates varies according to the topic. To ensure comprehension by all parties, the following terms have been selected to demonstrate an increasing level of knowledge.

#### **Definitions**

**Outline Knowledge:** The candidate must be familiar with the subject in outline terms. He/She should know that the topic exists and what it is applied to. In the context of methods/techniques the candidate would be expected to know "what it is, what it does" but would not be expected to know the finer points of application of the technique.

**Knowledge:** The candidate must have a working knowledge of the subject and be able to apply it.

**Detailed Knowledge:** The candidate must have a depth of knowledge sufficient to enable him/her to exercise judgment.

#### **Types of questions**

For all multiple-choice questions candidates are required to tick or otherwise indicate the correct answer in the space provided.

Candidates are expected to give a few words, a phrase or a sentence as answers for short answer questions in the space provided.

Candidates are required to explain in depth for open-ended questions.

### **1. Examination syllabus of Certified Testing Technician**

#### **1.1. General requirements (outline knowledge)**

##### **1.1.1. Understanding of ISO/IEC 17025**

- Document control
- Technical records
- Environmental conditions



- Equipment calibration requirements
- Sample handling such as storage conditions, etc.
- Quality control requirement

1.1.2. Laboratory safety (knowledge)

- General laboratory safety
- Safety in electrical testing laboratories

1.1.3. Integrity management (detailed knowledge)

- Prevention of Bribery Ordinance, Cap. 201
  - Corruption
  - Advantages
- Confidentiality and proprietary right
- Outside Employment
- Use of Company Assets
- Conflict of Interest
- PCSTP01 “Regulations – Professional Certification Scheme of Testing Personnel”
  - Code of ethics in general
  - Code of ethics in relation to employer
  - Code of ethics in relation to public
  - Obligation of Certified Testing Personnel
  - Use of Certification symbol and claim of certification status

1.2. Technical requirements (knowledge)

1.2.1. Understanding on basic laboratory techniques, related precautions, limitations and mal-practice

- Understanding of common electrical and electronic components, such as various types of motors, insulation, electronic components including semiconductor devices, transformers, fuses and means of electrical connections (i.e. different types of connectors, size of wires, etc.), and how they affect safety.
- Connection diagram
- Measurement techniques for one sub-category as given in Appendix 5
- Requirements of test standards for the selected sub-category as given in Appendix 7.

1.2.2. Equipment usage (knowledge)

- The criteria for selection of measurement equipment



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- Understanding of equipment calibration and measurement traceability, S.I. units
- Understanding of use of equipment for electrical and one sub-category as given in Appendix 6

## **2. Specimen examination questions**

2.1. Name two pieces of information that can be identified on a calibration label:

1. \_\_\_\_\_ 2. \_\_\_\_\_

2.2. What is the difference between creepage distances and clearances ?



## APPENDIX 2:

### **Examination syllabus and specimen questions for Certified Testing Professional**

#### **1. Competence requirements of Certified Testing Professional**

##### 1.1. Management requirements (Detailed Knowledge)

###### 1.1.1. Manager's Basic Functions

###### 1.1.2. Time Management

###### 1.1.3. Communication in Your Workplace

###### 1.1.4. Team Building – Basic understanding of concepts

###### 1.1.5. Delegation and Management of Generation Y

##### 1.2. Quality requirements

###### 1.2.1. Laboratory Management in compliance with ISO/IEC 17025 (Detailed Knowledge in the following aspects)

- Document control
- Review of contract
- Subcontracting
- Verification of critical consumables
- Difference between correction and corrective actions and control of non-conforming work
- Preventive actions
- Technical records – connection diagrams
- Environmental and sample conditioning requirement
- Traceability (acceptable control for visual assessment)
- Traceability (equipment)
- Sub-sampling requirements
- Sample identification and integrity within the laboratory
- Quality assurance procedures and plan
  - Method verification
    - Minimum method verification in complying with specification of test standards
    - Difference between verification and validation
    - Participation in proficiency testing programme, interlaboratory comparison programme
    - Verification of continuing competence
    - Drafting of test procedures



- Statistical treatments of data and quality control requirement (detailed knowledge)
  - Basic statistics such as student-t test, U distribution, normal distribution and standard deviation
- 1.2.2. Laboratory safety (knowledge)
  - General laboratory safety
  - Safety in electrical testing laboratories
- 2.2.1. Integrity management (detailed knowledge)
  - Prevention of Bribery Ordinance, Cap. 201
    - Corruption
    - Advantages
  - Confidentiality and proprietary right
  - Outside Employment
  - Use of Company Assets
  - Conflict of Interest
  - PCSTP01 “Regulations – Professional Certification Scheme of Testing Personnel”
    - Code of ethics in general
    - Code of ethics in relation to employer
    - Code of ethics in relation to public
    - Obligation of Certified Testing Personnel
    - Use of Certification symbol and claim of certification status
- 1.3. Technical requirements (knowledge)- 1.3.1. Estimation of measurement uncertainty
  - Approaches : ISO GUM, UKAS Lab 34
  - Factors affecting uncertainty
  - Reporting of uncertainty and compliance
- 1.3.2. Requirements of the following general equipment calibration:
  - Equipment for electrical and one sub-category as given in Appendix 6
- 1.3.3. Basic laboratory techniques and principles
  - Electrical and measurement techniques of one sub-category as given in Appendix 5
  - Application of the techniques to standards of the sub-category as given in Appendix 7.



**Professional assessment syllabus on sector specific tests (only for testing professional)**

- 1 Test standards and compliance requirements
- 2 Principles of test and reporting requirements
- 3 Scope and limitations

**2. Specimen examination questions**

- 2.1. Define correction and corrective actions. Illustrate the difference with an example.
- 2.2. Evaluate the standard uncertainty of a U-shape distribution?
- 2.3. What factors affecting the measurement of temperature rise of a battery operated toy car and how what measures should you take to ensure the consistency of the measurements and minimize the overall measurement uncertainty?

**APPENDIX 3****Training courses approved by the Certification Board**

Before 1 January 2012, candidate attending the courses as listed below is deemed to satisfy the competence requirements shown.

**1. Certified Testing Technician**

Competence requirements	Course Name	Training Provider
ISO/IEC 17025	Laboratory Management	HKAS/HKTIC
Laboratory Safety	Laboratory Safety	HKTIC/VTC/OSHC/Labour Department

**2. Certified Testing Professional**

Competence requirements	Course Name	Training Provider
ISO/IEC 17025	Laboratory Management for organizations implementing ISO/IEC 17025:2005	HKAS/HKTIC
Laboratory Safety	Laboratory Safety	HKTIC/VTC/OSHC/Labour Department
Measurement uncertainty	Guide to Expression of Uncertainty of Measurement	HKAS/HKTIC/SPACE

HKTIC – Hong Kong testing, Inspection and Certification Limited

HKAS – Hong Kong Accreditation Services

VTC – Vocational training Council

IVE – Hong Kong Institute of Vocation Education

OSHC - Occupational Safety and Health Council



As commence from 1 January 2012, candidate is required to obtain certificates of achievement (satisfactory results in end-of-course evaluation) in the following approved courses in meeting the competence criteria. Lists of training organizations and training courses are available on the Scheme website [www.hktic.org](http://www.hktic.org).

1. Certified Testing Technician (both quality and technical requirements)

Competence requirements	Course Name	Duration (hours)
Quality requirement	Understanding ISO/IEC 17025 and laboratory safety	9
Integrity requirements	Ethics	3
Technical requirements	Safety tests	40
Basic measurement methods and use of equipment	Electromagnetic computability tests	36
	Green tests	40

2. Certified Testing Professional

Competence requirements	Course Name	Duration (hours)
Management skills	Comprehensive management	14
ISO/IEC 17025 Statistical treatment of data and quality control requirement	Laboratory management	15
Safety	Laboratory safety	6
Measurement uncertainty	ISO GUM	21
Technical requirements	Safety tests	60
Principles of measurement methods and calibration/performance check requirements	Electromagnetic computability tests	45
	Green tests	60



## APPENDIX 4

### **Guidelines for counting Continuing Professional Development Unit (CPDU)**

<b>Activities</b>	<b>CPDUs</b>
Training course, seminar or workshop on relevant topics (Internal training and workshops on relevant topics are also counted <sup>Note1</sup> )	1 CPDU for candidate attending workshops or seminars which involve each contact hour.
Author or co-author of an article published in a refereed journal	30 CPDUs per article (author) 20 CPDUs per article (co-author)
Author or co-author of an article published in a non-refereed journal	15 CPDUs per article (author) 10 CPDUs per article (co-author)
Lecturer/Speaker on relevant topics at a conference, seminar or formal course.	10 CPDUs per activity
Member or moderator on relevant topics at a conference, symposium, workshop or formal course.	5 CPDUs per activity
Author or co-author of textbook on relevant field	40 CPDUs (author) 20 CPDUs (co-author)
Developer of content for a testing learning courseware.	10 CPDUs per new course
Board or committee member of testing or certification organization	20 CPDUs (board)per annum 10 CPDUs (committee) per annum
Development of new international/regional test standard	30 CPDUs
Verification and implementation of new international/regional test standard <sup>Note2</sup>	10CPDUs
Development of new accredited in-house method (limited to 3 developers) <sup>Note3</sup>	15 CPDUs
Technical visit	1 CPDU per each visit hour



Remarks:

- Note 1: Internal training should be organized in similar structure as external training with training materials, assessment and attendance or assessment certificate.
- Note 2: Organization should maintain evidence in support of competence in performing the tests including documentation (test procedures), satisfactory results in proficiency testing activities (proficiency testing programme, interlaboratory comparison programmes or verification by certified matrix reference materials).
- Note 3: Accreditation should be granted by HKAS (Hong Kong Accreditation Services) or accreditation body having MRA (mutual recognition agreement) with HKAS.



## APPENDIX 5

### Sub-categories and measurement methods of electrical products testing

#### (A) Sub-categories of electrical products testing

1. Safety tests
  - 1.1 Electrical measurements
  - 1.2 Temperature measurements
  - 1.3 Physical and mechanical measurements
  - 1.4 Materials analysis
- 2 Electromagnetic compatibility tests
  - 2.1 Electrical measurements
  - 2.2 Time and frequency
  - 2.3 EMC tests
- 3 Green tests
  - 3.1 Electrical measurements
  - 3.2 Temperature measurement
  - 3.3 Thermo radiation
  - 3.4 Material analysis

#### (B) Measurement methods of electrical products testing

- 1 Electrical Measurements
  - 1.1 measurement of resistance
  - 1.2 principles of operation of digital multimeters and calibrators
  - 1.3 measurement of direct voltage and current
  - 1.4 principles of calibration
  - 1.5 measurement of alternating voltage and current
  - 1.6 measurement of high voltage
  - 1.7 guarding, grounding and shielding
  - 1.8 cables and connectors
- 2 Electromagnetic Compatibility (EMC)
  - 2.1 Emission tests



- 2.1.1 Types of interference and their measurements
- 2.1.2 Harmonic current
- 2.1.3 Voltage fluctuation and flicker
  
- 2.2 Immunity tests
  - 2.2.1 radio-frequency fields susceptibility
  - 2.2.2 Electrical fast transient/ burst susceptibility
  - 2.2.3 Electrostatic discharge susceptibility
  - 2.2.4 Surge susceptibility
  - 2.2.5 Voltage dips, short interruption and voltage variation susceptibility
  
- 3 Physical and mechanical tests
  - 3.1 distinguish creepage distances and clearances
  - 3.2 use of Length or gap gauges
  - 3.3 means to protect probes, pins and gauge from rusting
  - 3.4 Linear and angular measurement
  - 3.5 Roundness Evaluation Methods
  - 3.6 Durameters Eddy Current and Indentation Testing, Range and Application of Scales, Conversion Relationships for hardness measurements
  - 3.7 Roughness average
  - 3.8 Mass and weight principles
  - 3.9 Weighing instruments, Classes, selection,
  - 3.10 Physical influences
  - 3.11 Stress and strain, Characteristics & operations of a load cell
  - 3.12 Torque concepts and applications, Torque testers calibration
  - 3.13 Vibration amplitude and vibration frequencies, vibration Parameters, motion, and Degrees of Freedom, the Selection of Acceleration, Velocity and Displacement Parameters
  
- 4 Material Analysis
  - 4.1 Flammability tests
    - 4.1.1 Types of flammability and their measurements
    - 4.1.2 Glow wire tests
    - 4.1.3 Ball pressure tests
    - 4.1.4 Needle flame tests
  - 4.2 Tracking tests



- 5 Temperature Measurements
  - 5.1 physics of temperature measurement
  - 5.2 temperature scale, traceability and international standards
  - 5.3 thermocouple electromotive force, measurement and calibration
  - 5.4 properties of thermocouples and systematic errors
  
- 6 Thermo radiation
  - 6.1 SI units
  - 6.2 Wave and particles model and speed of propagation
  - 6.3 Thermal radiation and electromagnetic radiation as a form of heat and its measurement
  - 6.4 Electromagnetic spectrum – light and radio waves and their measurements
  
- 7 Time and Frequency Measurements
  - 7.1 clocks, oscillators and frequency standards
  - 7.2 time scales and international timekeeping
  - 7.3 evaluating the performance of time and frequency standards
  - 7.4 selection of clocks and oscillators to suit applications
  - 7.5 computer time and Network Time Protocol
  - 7.6 frequency and time interval measuring instruments
  - 7.7 measurement and analysis techniques for time and frequency calibrations
  - 7.8 rf and microwave devices
  - 7.9 fibre optics background



## APPENDIX 6

### List of equipment required for each sub-category

- 1 Common
  - 1.1 Signal generator
  - 1.2 Multi meter
  - 1.3 Frequency converter
  - 1.4 Length measuring devices
  - 1.5 Weight measuring devices
  - 1.6 Force measuring devices
  
- 2 Safety test
  - 2.1 Ball pressure test apparatus
  - 2.2 Environmental chambers
  - 2.3 Fixtures and dimension gauges
  - 2.4 Force and torque gauges
  - 2.5 Glow-wire test apparatus
  - 2.6 Leakage current meter
  - 2.7 Spectrum analyzers
  - 2.8 Spring operated impact hammers
  - 2.9 Surge generators
  - 2.10 Temperature recorders
  - 2.11 Test fingers
  - 2.12 High port tester
  - 2.13 Tracking tester
  - 2.14 Power analyzers
  - 2.15 Oscilloscope
  
- 3 EMC test
  - 3.1 Anechoic chambers
  - 3.2 Antennae
  - 3.3 Absorbing clamps
  - 3.4 Electromagnetic field probes
  - 3.5 EMI Receivers
  - 3.6 Environmental chambers
  - 3.7 ESD Guns



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3.8 Fast transient burst generators

3.9 LISN

3.10 Spectrum analyzers

3.11 Surge generators

3.12 Voltage dip generators

3.13 Oscilloscope

4 Green test

4.1 Environmental chambers

4.2 Oscilloscope



## APPENDIX 7

### References

1. *ISO/IEC 17025:2005* "General requirements for the competence of testing and calibration laboratories"
2. *HKTIC PCSTP01* "Regulations for Professional Certification Scheme for Personnel"
3. *ISO 5725-3: 1994* Accuracy (trueness and precision) of measurement methods and results Part 3 – Intermediate measure of the precision of a standard measurement method
4. *ISO/IEC 98* Guide to Uncertainty in Measurement
5. *ASTM D2904- 97 (Re-approved 2002)* Standard Practice for Interlaboratory Testing of Textile Test Method that Produces Normally Distribute
6. *HOKLAS Supplementary Criteria No. 14* "Electrical and Electronic Products" Test Category – Product Safety Tests
7. *HOKLAS Supplementary Criteria No. 46* Accreditation Criteria for HOKLAS – ENERGY STAR<sup>®</sup> program Laboratory for Testing Electrical and Electronic Products
8. *Test standards for Safety tests*
  - 8.1. *IEC 60950 (UL 60950)* Information technology equipment – Safety
  - 8.2. *IEC 60065 (UL60065)* Audio, video and similar electronic apparatus - Safety requirements
  - 8.3. *IEC 60335* Safety of electrical household appliances
  - 8.4. *IEC 60598 (UL 1598)* Luminaires
  - 8.5. *IEC 60601* Medical Electrical Equipment
9. *Test standards for Electromagnetic compatibility tests*
  - 9.1. *IEC61000-3-2* Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)
  - 9.2. *IEC61000-3-3* Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of



voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase and not subject to conditional connection

- 9.3. *EN 55013* Sound and television broadcast receivers and associated equipment. Radio disturbance characteristics. Limits and methods of measurement
- 9.4. *EN55014* Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Emission
- 9.5. *EN55020* Sound and television broadcast receivers and associated equipment. Immunity characteristics. Limits and methods of measurement
- 9.6. *EN55022* Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement
- 9.7. *ETSI EN301 489* ElectroMagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services
- 9.8. *ESTI EN300 220* ElectroMagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services

#### 10. *Test standards for Green tests*

- 10.1. *IEC 62087* Methods of measurement for the power consumption of audio, video and related equipment
- 10.2. *IEC 62301* Household electrical appliances - Measurement of standby power
- 10.3. *AS/NZS 4665.1 /2* Performance of External Power Supplies
- 10.4. *IEC 62552* Household Refrigerating Appliances – Characteristics and test methods
- 10.5. *ISO 5151* Non-ducted air conditioners and heat pumps -- Testing and rating for performance
- 10.6. *ANSI/AHAM DH-1* Dehumidifiers
- 10.7. *IEC 60379* Methods for measuring the performance of electric storage water-heaters for household purposes
- 10.8. *IEC 60456* Clothes washing machines for household use – Methods for measuring the performance
- 10.9. *IEC 60969* Self-ballasted lamps for general lighting services Performance requirements
- 10.10. *CIE 84* Measurement of Luminous Flux
- 10.11. *IEC 61341* Method of measurement of centre beam intensity and beam angle(s) of reflector lamps
- 10.12. *IEC/PAS 62612* Self-ballasted LED-lamps for general lighting services - Performance requirements



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## 11. *GUIDEBOOKS FROM LABOUR DEPARTMENT OF HKSAR*

- 11.1. A brief guide to first aid
- 11.2. A brief guide to the Occupational Safety and Health Ordinance
- 11.3. A brief guide to the Occupational Safety and Health Regulation
- 11.4. Code of practice on safety management
- 11.5. Guidelines for good occupational hygiene practice in a workplace
- 11.6. Hazards during chemicals in use and safety guidelines

## 12. *Standards in relation to laboratory safety*

- 12.1. AS2243 Part 7 Safety in Laboratories Electrical aspects
- 12.2. BS EN 61010-2 Safety requirements for electrical equipment for measurement, control and laboratory use
- 12.3. BS 7258 Laboratory fume cupboards
- 12.4. AS 2444 Portable fire extinguishers and fire blankets - Selection and location
- 12.5. AS/NZS 2243.8 Fume cupboards
- 12.6. AS/NZS 2243.10 Storage of chemicals

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