



Asia Pacific Laboratory Accreditation Cooperation

**APLAC T063 Safety Test for Creepage and Clearance Distance
Proficiency Testing Program
Instruction to Participating Laboratories**

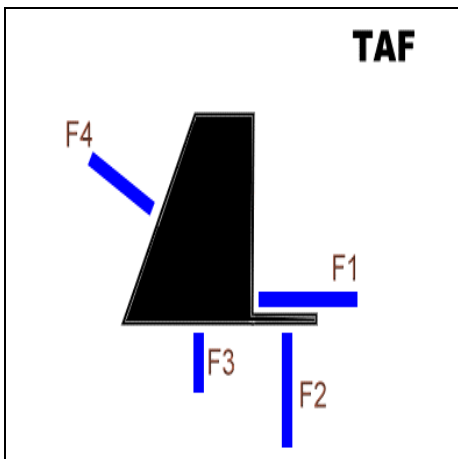
To ensure that results from this program can be analyzed properly, participants are asked to adhere carefully to the following instructions.

1. SAMPLE

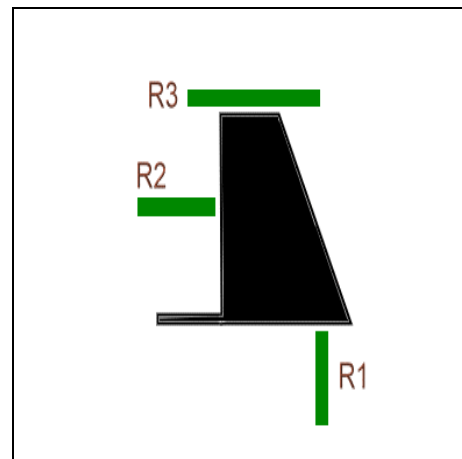
The participating laboratory will obtain one square Printed Circuit Board. On receipt of the artifacts, unpack and inspect them for any defects. Please contact with your accreditation body if the sample is damaged.

2. TESTS TO BE PERFORMED

Sample Information: The sample-Printed Circuit Board size is 6x6 cm² with TAF logo on the front. Please refer to the following figures:



Frontage of the Sample



Back of the Sample

Blue: Track on the front of sample with the logo of TAF

Green: Track on the back of sample

Black: Trapezoid cut out of sample

CTL DECISION SHEET

Standard: IEC 60664-1/1992 IEC 60335-1/2001 IEC 61010-1/2002 IEC 61058-1/2000 IEC 61008-1/2002 IEC 60947-1/2004 IEC 60598-1/2003 IEC 60065/2005 IEC 60950-1/2001	Sub clause: <p style="text-align: center;">See Table below</p>	DSH N°: 590 Page: 1(1)
Subject: Rule for creepage across grooves and similar surface discontinuities	Key words: <ul style="list-style-type: none"> - Creepage - Grooves - Conducting path - Shortest distance - Through air 	Decision approved by the CTL during its 43rd meeting in Johannesburg
<p>Question: As can be seen from examples 2 and 6 of IEC 60664-1 sub clause 4.2 corners with angles greater or equal than 90 degrees are not bridged. IEC 60664-1 does not contain specific information at which angle less than 90 degrees bridging shall be applied. Some of the above mentioned standards specify that bridging shall be applied for angles less than 80 degrees. Can this 80 degree rule be applied in general for all standards?</p> <p style="margin-top: 100px;">Decision: Yes. The 80 degree rule shall be applied in general for all standards.</p>		

Information which standards do already contain the 80 degree rule

Standard	Clause/ Annex	Product	80-Degree Rule Included
IEC60664-1: 1992	cl. 4.2	Horizontal Standard	No
IEC60335-1: 1991	Annex E	Household Appliances	Yes
IEC60335-1: 2001	Cl. 29	Household Appliances	No (Note 1)
IEC60730-1: 1999	Annex B	Automatic Controls	Yes
IEC60950: 1999	Annex F	IT Equipment	Yes
IEC60950-1: 2001	Annex F	IT Equipment	Yes
IEC60065: 2005	Annex E	Consumer Electronic Eqpt.	Yes
IEC61010-1: 2002	Annex C	Laboratory Measuring Eqpt.	No
IEC60601-1: 1988	Notes to Figs 39-47	Medical Eqpt.	Yes
IEC61558-1: 1988	Annex A	Power Transformers	Yes
IEC61058-1: 2000	Annex A	Switches	No
IEC60598-1: 2003	-	Luminaires	- (Note 2)
IEC60745-1: 2001	Annex A	Power Tools	Yes
IEC61008-1: 2002	Annex B	RCCBs	No (Note 3)
IEC60947-1: 2004	Annex G	LV Switch Gear	No

Notes

1. IEC60335-1 refers directly to IEC60664-1.
2. The luminaire standard gives no guidance on the rules for identifying creepage paths, referring to IEC 60664-1 only for the treatment of pollution degree.
3. This Standard includes the condition that grooves having a depth less than 1mm should be neglected (i.e. the creepage path 'jumps' the groove).

Testing Period: Test should be finished **within one week** after receiving the sample.

Test Method: The standard of applying for creepage and clearance distance determinations are **IEC60664-1: 2002 clause 4.2**. In addition, the participants are requested to refer to **CTL decision sheet 590**. (Please see the attachment.)

Test Items: Measure Creepage and Clearance distances. The testing points details refer to Result Sheet (1), the each position should be measured 2 times, and then record the data and the average value in the Result Sheet (1). The creepage and clearance distances measurement unit should be millimeter (mm) to in one decimal place.

In the description blank, please describe the creepage and clearance distances path illustration of the chosen measurement points, and then show the measurement calculating method, in addition, to fill the data in the Result Sheet (2) and (3).

Where possible, uncertainties should be calculated using the method in the ISO Guide to the Expression of Uncertainty in Measurements.

3. DOCUMENTS TO BE SUBMITTED

Within one week of the completion of the tests, participating laboratories are required to send the Result Sheet(s) to their accreditation body (AB).

No other documents are required. Laboratories should make a copy of all documents and worksheets for their own records and keep these on file for an adequate period of time (at least until a final report has been issued).

An interim report draft with all the received data tabulated in a well-formatted table and the consensus values of each test will be sent out to all participating AB, then kindly request the participating AB distributes the interim report draft to the participating laboratories. Any clarification or correction of results should be made within 2 weeks after receipt of the interim report draft.

A final report will be issued at the end of the program with each participant only identified by a **confidential** code number.

4. CONFIDENTIALITY

For this program your laboratory has been allocated the code number shown on the interim report draft. All reference to your laboratory in reports associated with this program will be with this code number, thus ensuring confidentiality of results.

5. **GENERAL INFORMATION**

For general queries, please contact with your accreditation body, additional information may be obtained from:

Taiwan Accreditation Foundation (TAF)

Ms. Jean Yang

TEL : +886-3-5714848 Ext 224

FAX : +886-3-5726308

E-mail: jeanyang@taftw.org.tw



Asia Pacific Laboratory Accreditation Cooperation

**APLAC T063 Safety Test for Creepage and Clearance Distance
Proficiency Testing Program
Result Sheet (1)**

Lab Code:

Accreditation Body: _____

Lab Name: _____

Test Ambient: _____ °C; _____ % R.H. Test Date: _____ (day/month/year)

Creepage Distance Measurement (in one decimal place)

Sample No.: _____

No.	Locations between	1st (mm)	2nd (mm)	Average (mm)	Instrument Type (*)	Exp. Uncertainty
1	F1 and F2					
2	F2 and F3					
3	R1 and F3					
4	R1 and R2					
5	R1 and R3					

Clearance Distance Measurement (in one decimal place)

No.	Locations between	1st (mm)	2nd (mm)	Average (mm)	Instrument Type (*)	Exp. Uncertainty
1	F1 and F2					
2	F2 and F3					
3	R1 and F3					
4	R1 and R2					
5	R1 and R3					

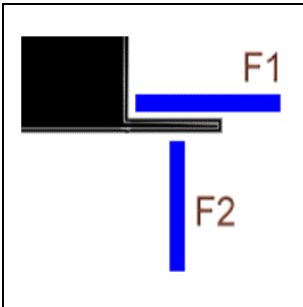
*** Please tick the Instrument Type that you use in this program, and then fill in the table above.**

- A: viewed with hand lens, measured with separate ruler
- B: viewed with loupe, measured with separate ruler
- C: viewed with hand lens, measured with separate vernier callipers
- D: viewed with loupe, measured with separate vernier callipers
- E: viewed with hand lens, measured with separate micrometer
- F: viewed with loupe, measured with separate micrometer
- G: viewed and measured with integrated lens/reticule
- H: viewed and measured with integrated micrometer
- I: other, _____

Test Method: _____

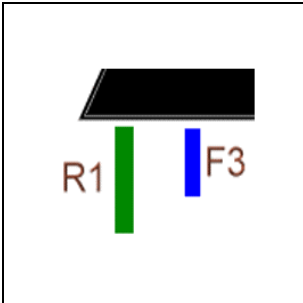
Result Sheet (2)

1. Please describe the creepage distance of F1 and F2.



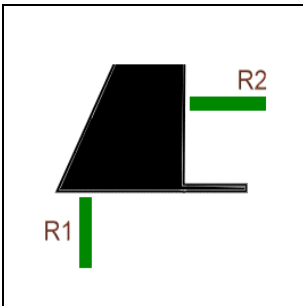
Description:

2. Please describe the creepage distance of R1 and F3.



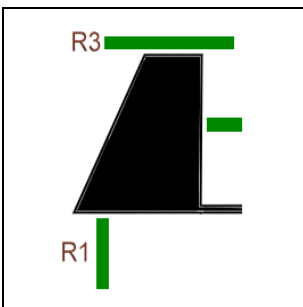
Description:

3. Please describe the creepage distance of R1 and R2.



Description:

4. Please describe the creepage distance of R1 and R3.



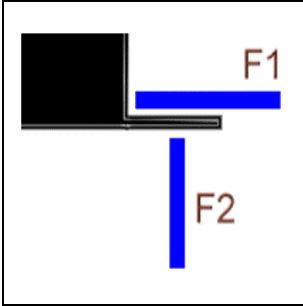
Description:

Signature: _____

Date: _____

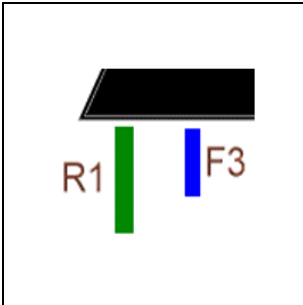
Result Sheet (3)

1. Please describe the clearance distance of F1 and F2.



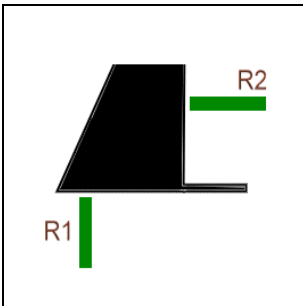
Description:

2. Please describe the clearance distance of R1 and F3.



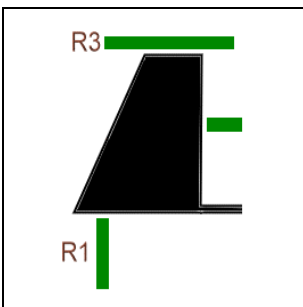
Description:

3. Please describe the clearance distance of R1 and R2.



Description:

4. Please describe the creepage distance of R1 and R3.



Description:

Signature: _____

Date: _____

Measurement Uncertainty Budget

Items	Factors of Uncertainty x_i	Type A / Type B	Probability Distribution	Standard Uncertainty $u(x_i)$	Coverage Factor(κ)
Combined Standard Uncertainty $u_c(Y)$:					
Expanded Uncertainty (95% confidence interval) $U_{exp} = \kappa \times u_c(y)$:					

Please make copies of this form if there is not enough blank.

Signature: _____

Date: _____

INSTRUCTIONS – MEASUREMENT UNCERTAINTY

Part (1) Background information & justification for this change

ISO/IEC 17025 requires that, except under specified conditions, the uncertainty of measurement associated with the results of tests and measurements must be estimated.

What is uncertainty of measurement?

Uncertainty of measurement is defined as a “parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand” (the measurand is the particular quantity subject to measurement).

The result of a test or measurement is our best estimate of the true value of the measurand. The result is imperfect. The true value of the measurand is contained within a range of values about the measurement result and the “uncertainty of measurement” is an estimate of the magnitude of that range expressed at a given level of confidence (confidence interval). Uncertainty of measurement is usually given as a 95% confidence interval and would normally be expressed in the appropriate SI units (ie. mm, °C, g/l, MPa etc).

For example, the result of a measurement might be 5.1 mg/l with an uncertainty of ± 0.2 mg/l at a 95% level of confidence. This means that there is an estimated 95% probability that the true value is in the range 4.9 mg/l to 5.3 mg/l. The 95% probability means that there is an estimated one in twenty chance that the true value is outside that range.

Uncertainty of measurement may also be expressed as a percentage where appropriate.

To assist laboratories to comply with the requirements of ISO/IEC 17025 for estimating uncertainty and to promote a uniform methodology in its estimation, information packages for APLAC PT testing program participants now include general guidance relating to estimating uncertainties for the specific testing involved, and final program reports will now include relevant worked examples. All program participants are required to report their estimates of uncertainty to their accreditation bodies along with their results unless the Technical Adviser to the program specifically waives any requirement to estimate uncertainties. The estimates of uncertainty provided by participants will be incorporated into the final program reports enabling direct comparison of uncertainty estimates across the program participants. The uncertainty estimates will not be used in the evaluation of the results on the primary samples.

How is uncertainty of measurement to be estimated?

APLAC expects that program participants’ uncertainties of measurement would be estimated in accordance with the requirements of the respective member accreditation bodies. There are different approaches and methodologies available. Worked examples provided in APLAC PT program reports will generally be based on ISO GUM but will recognise other methodologies in accordance with 5.4.6.3 NOTE 3 in ISO 17025.

Estimates of uncertainty of measurement provided by program participants are required to be given at the 95% level of confidence.

ISO GUM methodology

An estimate of uncertainty of measurement would usually be based on the combination of a number of influencing parameters (components of uncertainty) such as errors in reference values, instrument errors, repeatability, thermal effects, weighing errors, inhomogeneity etc. ISO GUM methodology requires that the influence of each component of uncertainty on the measurement result be quantified and expressed numerically as a standard deviation. These values are then combined according to the rules of the propagation of uncertainty to produce a combined standard deviation (combined standard uncertainty) and the combined standard uncertainty is multiplied by a coverage factor to produce an expanded uncertainty at the required level of confidence. Detailed descriptions and information on the implementation of this methodology have been published by ISO2, UKAS3 and Eurachem/CITAC4 and made available over the internet⁷.

Uncertainty of measurement is best estimated within the individual laboratory environment. All factors which will have a significant influence on the test or measurement result must be included in the estimation process. There must be suitable programs utilising reference standards, instruments and materials to ensure on-going and adequate quality control and repeatability and reproducibility of methods and equipment over time. In many instances, it will be possible to utilise quality control data in assessing uncertainty components such as precision. Where these data are not available, it may be necessary to carry out precision studies or to rely on published information about the method or portions of it until the laboratory can obtain its own estimates.

APLAC is aware of the general need for better estimates of uncertainty, and estimates that are obtained under similar conditions in all laboratories. PT programs are useful mechanisms for spreading awareness of uncertainty of measurement and the effects of different ways of estimating it. We anticipate that the information made available through PT programs will help focus discussions on uncertainty of measurement.

APLAC Technical Committees will interpret the information and report on current practices. They will also make recommendations for improving the collection of uncertainty data, the estimation of uncertainties and incorporating data and information on uncertainty of measurement into PT program reports. Therefore we anticipate an evolution in the mechanisms for collecting and reporting uncertainty data and associated information over the next few years.

Participation in APLAC PT programs should assist laboratories to develop appropriate estimates of uncertainty, help to guide accreditation bodies to adopting common and consistent approaches leading to enhanced understanding and international comparability of measurements among the member nations.

APLAC will consider the use of estimates of uncertainty of measurement in the evaluation of its PT testing program results after it is satisfied that participating laboratories are estimating uncertainties

of measurement in an appropriate and consistent manner.

Here are a few important terms:

Standard uncertainty ($u(xi)$) is an input component of uncertainty xi expressed as a standard deviation. It should be expressed in the units of the influencing parameter, but may be expressed as a percentage where convenient.

Type A evaluation estimates of standard uncertainty are evaluated by applying statistical techniques to a series of repeatability or curve fitting data. For example, a standard uncertainty estimated from the repeatability of measurements on replicate samples is a Type A evaluation.

Type B evaluation estimates of standard uncertainty are based on assumed probability distributions, experience, laboratory records, or other information. For example, a standard uncertainty estimated using data provided on a calibration certificate is a Type B evaluation.

Sensitivity coefficient (ci) is the mathematical relationship between an influencing parameter and its effect on the result of a measurement. In many instances it is unity. That is, there is a one to one relationship between the value of the influence and its effect on the measurement result. For example, when weighing a sample of material, any uncertainty due to errors in the balance reading will have a one to one effect on the measurement result. On the other hand, if we are considering the influence of temperature on the length of a metal bar then the sensitivity coefficient is equal to the coefficient of linear thermal expansion for the metal bar multiplied by the length of the bar. It is important to note that a sensitivity coefficient has units. It is also important to note that the calculation methodology used by Eurachem/CITAC⁴ incorporates sensitivity coefficients in a manner that does not require their specific evaluation.

Combined standard uncertainty ($uc(y)$) is the final estimate of uncertainty for the test or measurement result y expressed as a standard deviation. It is calculated by multiplying the standard uncertainty $u(xi)$ for each input component (xi) with its respective sensitivity coefficient ci to produce $ciu(xi)$ and then combining those values by taking the square root of the sum of their squares. Note that the products $ciu(xi)$ must each be expressed in the same units as those required for expressing the combined estimate $uc(y)$.

Expanded uncertainty (U) is the final result of our estimate of uncertainty expressed as a confidence interval. It is calculated by multiplying the combined standard uncertainty by a coverage factor to produce the desired level of confidence (usually 95%).

Coverage factor (k) is a multiplier used to expand the combined standard uncertainty $uc(y)$ to an interval that is estimated to contain the true value of the measurand at a given level of confidence ($U = k \cdot uc(y)$). The coverage factor then represents the number of standard deviations in the expanded uncertainty and is determined according to the Student-t distribution. A coverage factor of 2 is commonly used to approximate the expanded uncertainty to the 95% confidence level.

References

1. ISO-IEC 17025:1999. General requirements for the competence of testing and calibration laboratories. ISO, Geneva (1999)
2. Guide to the Expression of Uncertainty in Measurement. ISO, Geneva (1993)
3. UKAS LAB 12: The Expression of Uncertainty in Testing. UKAS, London (2000)
4. Eurachem / CITAC Guide QUAM: 2000.P1. Quantifying Uncertainty in Analytical Measurement, 2nd Edition (2000)
5. ISO/DTS 21748:2002 Guide for the use of repeatability, reproducibility, and trueness estimates in measurement uncertainty estimation.
6. APLAC TC 005, Interpretation and Guidance on the Estimation of Uncertainty of Measurement in Testing
7. www.A2LA.org / (for A2LA policies, links to guidance documents, including the UKAS Guide, and the Eurachem/CITAC Guide, at no cost), www.measurementuncertainty.org / (Eurachem/CITAC Guide), www.fasor.com/iso25 / (general information, links, and discussion of ISO-IEC 17025)