SGS BASEEFA LTD'S POLICY ON THE "DECISION RULE" RELATED TO TESTING AND UNCERTAINTY OF MEASUREMENT IN TESTING

It is a requirement of accreditation to ISO/IEC 17025:2017 that a testing laboratory publicizes its "Decision Rule" related to the outcome of each test performed in its laboratory.

Note: For further information see ISO/IEC 17025 clauses 7.1.3 and 7.8.6.1.

The purpose of this publication is to explain the relevant Decision Rules applied by SGS Baseefa Ltd and how they are derived.

GENERAL POLICY

The note to clause 26.1 of IEC 60079-0:2018 reads:

"Due to the safety factors incorporated in the types of protection, the uncertainty of measurement inherent in good quality, regularly calibrated measurement equipment is considered to have no significant detrimental effect and need not be taken into account when making the measurements necessary to verify compliance of the equipment with the equipment requirements of the relevant part of IEC 60079."

Accordingly, SGS Baseefa Ltd does not generally quote Uncertainty of Measurement values in its formal test reports related to conformity with the requirements of parts of IEC 60079.

For ignition events, the test methods described in the standards provide a significant safety margin to ensure, with a reasonable probability, that the variability of such ignition events (and any related measurement uncertainty) are taken into account.

Other than for ignition events (where uncertainty is not considered), SGS Baseefa Ltd has agreed that the uncertainty values declared in Schedule A (reproduced as an Annex to this publication) represent the levels of uncertainty that can be equalled or bettered by "good quality, regularly calibrated measurement equipment".

In many cases, the instrumentation used for a test will have a level of uncertainty significantly better than that declared in Schedule A.

SHARED RISK

Unless otherwise specified, SGS Baseefa Ltd works on the principle of "shared risk":

Where an indicated value lies close to a limit value, such that the uncertainty of measurement is greater than the difference between the two, it is not possible to state unequivocally that either compliance or non-compliance has been demonstrated.

Under these circumstances, taking the indicated value as representing the true value, and declaring compliance or non-compliance on that basis gives an equal probability that either:

- compliance has been confirmed when it could not be absolutely demonstrated; or,
- non-compliance has been confirmed when it could not be absolutely demonstrated

(both within the limits of uncertainty of the measurement).

There is therefore an equal shared risk between the manufacturer and the purchaser of an equipment as to whether the equipment did or did not exactly meet the requirements of the test specification.

SGS Baseefa Ltd has taken the view that, as a third-party certifier, it has an equal duty to the manufacturer and purchaser of equipment and that, in relation to the generality of test measurements, beyond the specific circumstances of IEC 60079-0, this shared risk is acceptable provided that the levels of uncertainty involved in the test measurements are sufficiently low. For this purpose "sufficiently low" is equated to the values of uncertainty listed in SGS Baseefa Ltd Schedule "A".

INPUT QUANTITIES FOR TESTS (OTHER THAN THOSE INVOLVING IGNITION EVENTS)

Where an input quantity for a test has a specified tolerance, the target value is generally the centre of the tolerance band and, in that case, the uncertainty of the instrumentation (at a confidence probability of not less than 95%) should be less than or equal to half the tolerance band. Alternatively, if the target value cannot be the centre of the tolerance band, the target value is determined such that the true value will lie within the tolerance band, with a confidence probability of not less than 95%.

Example: A high voltage insulation test specified as 500V (+20V -0V) for 60s (+5s -0s) is performed at an indicated value as close as possible to 510V for 62.5s using a voltmeter with an uncertainty less than ± 10V at 510V and a watch or clock with an uncertainty less than ± 2.5s at 62.5s.

Where an input quantity for a test has no specified tolerance, the target value is the specified value. The instrumentation used to measure the target value should have an uncertainty that is no greater than that declared in Schedule A.

Example: A thermal test is to be performed at "the most unfavourable supply voltage between 90% and 110% of the rated voltage". If it is determined that temperature will increase with increasing supply voltage, the test is performed with a target input voltage of 110% rated voltage, using a voltmeter having an uncertainty no worse than that declared in Schedule A to assist setting the input voltage to the target voltage.

Where an input quantity is a calculated value (calculated from two or more input sources), the uncertainty of one or more of the input sources may exceed Schedule A, provided that the calculated input quantity has an uncertainty (at a confidence probability of not less than 95%), no greater than that declared in Schedule A.

Example: An impact test is described as being a 1-kilogram weight dropped from a height of 0.7 metre; the intention being to produce a resultant impact energy of 7 joules. The uncertainty of either the weight or the height may exceed Schedule A, provided that the uncertainty of the calculated energy value satisfies Schedule A.

OUTPUT QUANTITIES OF TESTS

Many tests performed by SGS Baseefa Ltd have no measured output quantity, e.g. ignition tests, and allocation of uncertainty is not relevant.

For tests that require the use of a go/no-go gauge, the uncertainty of the gauge is considered as an input quantity and allocation of output uncertainty is not relevant.

Example: The fit of a screw-thread determined with a thread gauge.

Where an output of a test is a measured value, compliance is based on the indicated value, with no account taken of uncertainty, provided that the measurement uncertainty satisfies Schedule A.

Example: Short-circuit current of a cell or battery.

Where an output of a test is a calculated value (calculated from two or more measured values), compliance shall be based on the calculated value, with no account taken of uncertainty, provided that the uncertainty of each measurement satisfies Schedule A.

Example: Measurement of temperature rise and correction for standard ambient, for the purpose of demonstrating compliance with a specified Temperature Class.

If the calculated quantity has a value declared in Schedule A, this should also be satisfied. Uncertainties are combined either arithmetically, or using the root-sum-square method, whichever is appropriate.

Example: Calculation of electrical power by multiplication of measured voltage and current.

REPORTING OF UNCERTAINTIES

SGS Baseefa Ltd does not routinely state the value of uncertainties of measurement in test reports unless the values of uncertainty applicable to either the input or the output quantities exceed the values declared in Schedule A, or if a specific requirement exists to operate to uncertainties lower than those declared in Schedule A.

If an applicant requests that values of uncertainty are stated in a report, either the values listed in Schedule A are given, or the actual values of uncertainty for the instrumentation used, as listed on the SGS Baseefa Ltd Equipment Calibration Database, as appropriate.

SCHEDULE A

Unless specified elsewhere for a specific test, the limits of uncertainty for the quantities specified in the SGS Baseefa Ltd United Kingdom Accreditation Scheme (UKAS) testing schedule are:

QUANTITY	RANGE	UNCERTAINTY
Capacitance	1–10 pF 10 pF–1000 µF	±15% ±2.0%
Current 40–60 Hz	<20 A >20 A	±1.5% ±2.5%
Current DC	<20 A >20 A	±1.5% ±2.5%
Explosion pressure	0–100 BAR	±4.0%
Flow	ALL	±5.0%
Force	ALL	±2.0%
Frequency	ALL	±0.2%
Humidity	30–95% RH	±8%
Inductance	0.01–0.1 mH 0.1–1000 mH	±15% ±2.0%
Linear dimension	<25 mm >25 mm	±0.05mm ±0.25%
Mass	<100 g >100 g	±1.0% ±2.0%
Optical power	ALL	±10%
Oxygen concentration	0–21%	±0.2%
Power	<1 W 1 W–3 kW >3kW	±1.0% ±5mW ±1.5% ±5%
Pressure	0–1 BARG >1 BARG	±50mBar ±2%
Resistance	<20 Ω 20 Ω–20 MΩ >20 MΩ	±2.5% ±1.0% ±10%
Temperature non-contact	0–450°C	±10%
Temperature	<100°C >100°C	±2.0°C ±2.0%
Time	>5 seconds	±1.0%
Torque	ALL	±10%
Vacuum	0 to–1 BARG	±50mBAR
Voltage transient	<1 V >1 V	±5.0% ±10%
Voltage 40–60HZ	<1 V 1–1000 V >1000 V	±1.5% ±1mV ±1.5% ±2.5
Voltage DC	<1 V 1–1000 V >1000 V	±1.5% ±1mV ±1.5% ±2.5%
Impact energy	0–20 J	+2.0%–0%

The percentage values of uncertainty are obtained with standard instrumentation used at one-tenth full scale and above. At near full scale, the values of uncertainty are typically one-tenth of the values quoted in Schedule A. A reduced scale range may be specified for a specific instrument. For many quantities, a reduced uncertainty can be obtained by selecting particular instrumentation.

Note: At one time, Schedule A was a publication of the UKAS and its forerunners. When Schedule A was formally withdrawn by the accreditation body, SGS Baseefa Ltd decided that it was appropriate to maintain it as an agreed level of maximum uncertainty to be applied when using good quality regularly calibrated measuring equipment.

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WHEN YOU NEED TO BE SURE

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