UKAS or traceable calibration

How do I choose the right option?

Introduction

First…what exactly is a calibration?

- Answers the question - is my measuring device accurate?

- The process of checking a measuring instrument to determine if it is accurate compared to standards held at national or international metrology institutes.

- It is not an adjustment as many people believe.

Calibration Disciplines

Electrical

Flow

Humidity

Radio Frequency

Dimensional

Pressure

Temperature

How?

- Compare measurements to more accurate equipment
- Calibration certificate produced that is unique to the unit under test
- Details differences in readings between the two devices – the ‘error’
- Subject to uncertainties of measurement

Unbroken chain of calibration

1. E.g. official kilogram
2. Copy kilogram calibrated (compared)
3. Copy of copy kilogram calibrated (compared)
4. Used to calibrate scales, subject to uncertainty of measurement

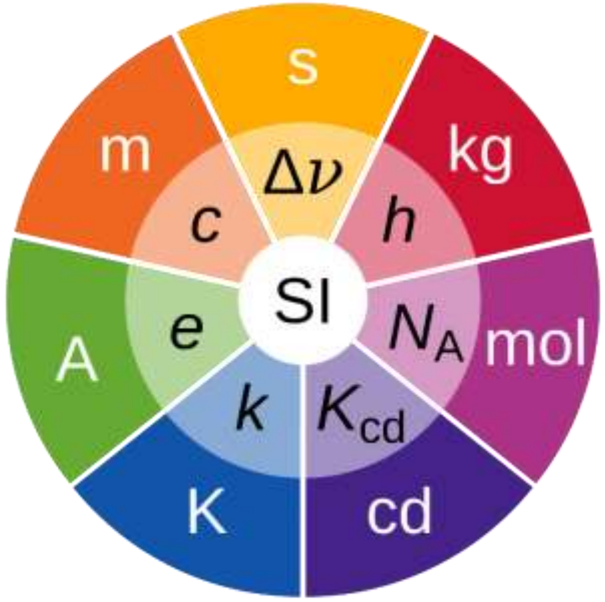
Uncertain about uncertainties of measurement?

- Doubt that exists about the measurement
- Statistically derived taking into account all factors that could affect the calibration process
- e.g. +/- 0.2mg

SI (Systeme International) Units

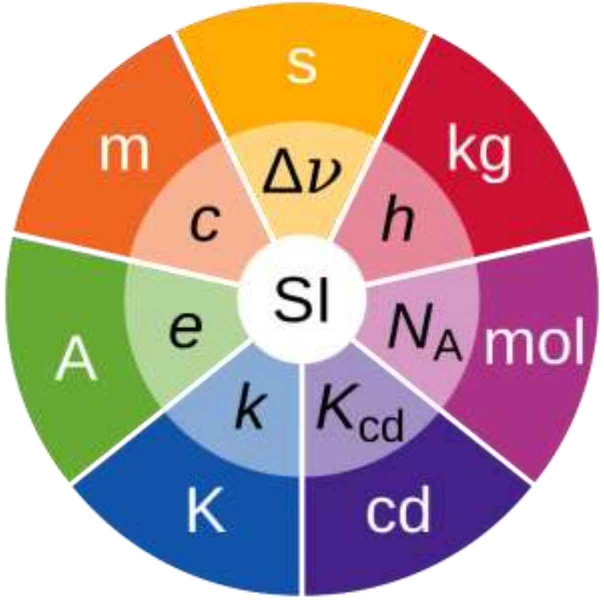
- SI units, more commonly referred to as the metric system, are the basis for modern calibrations

  - m - Meter - Length
  - s - Second - Time
  - mol - Mole - Amount of Substance
  - A - Ampere - Electric Current
  - K - Kelvin - Temperature
  - cd - Candela - Luminous Intensity
  - kg - Kilogram - Mass



SI (Systeme International) Units

- SI units were chosen as they are considered independent of dimension.
- The kilogram is the last standard to still be tied to an actual object.
- E.g. The meter is the length of the path travelled by light in a vacuum during a time interval of 1/299 792 458 of a second.



Measurement of Uncertainty

- Think of using a ruler that has 1/32 inch divisions.
- While you can guess where a measurement might fall in between the divisions, you only really know 1/32 of an inch.
- If you could measure to smaller increments you would have a smaller measurement uncertainty than 1/32 of an inch.

Who calibrates for the calibrator?

Calibration companies should send their equipment away to third parties for independent verification that their calibration equipment is accurate.

Standards and Options

What is ISO/IEC 17025?

- ISO is the international organisation that writes industry standards.

- I.e. they write the rules.

- ISO/IEC 17025 is the industry standard for calibration

What is UKAS?

UKAS – United Kingdom Accreditation Service.

Recognised internationally by:
European co-operation for Accreditation (EA)
International Laboratory Accreditation Cooperation (ILAC)
International Accreditation Forum (IAF)

UKAS oversees the ISO rules.

UKAS
A world of confidence

What is UKAS?

- UKAS is an international accreditation body that ensures:
  - Competence
  - Impartiality
  - Integrity

…of testing and calibration laboratories through independent assessment to ISO/IEC 17025 standards.

What is UKAS (ISO/IEC 17025) calibration?

- A calibration that is performed to international ISO standards by an accredited 3rd party (e.g. Calibrationhouse)

- Peace of mind that calibration performed to a high standard by a trustworthy laboratory

What is traceable calibration?

- A calibration performed by an unaccredited 3rd party
- Traceable to national standards
- I.e. using test equipment that has been calibrated by a UKAS accredited company

Differences in Certificates?

Traceable:

CERTIFICATE OF CALIBRATION

ISSUED BY SEAWARD ELECTRONIC LIMITED

DATE OF ISSUE 28 April 2023

CERTIFICATE NUMBER SEA071825 / 2R / 2

UKAS:

CERTIFICATE OF CALIBRATION

ISSUED BY SEAWARD ELECTRONIC LIMITED

DATE OF ISSUE 28 April 2023

CERTIFICATE NUMBER SEA071825 / 2R / 2

ilac-MRA

UKAS CALIBRATION

0809

UKAS has Environmental Conditions

Requested By:	CalibrationHouse 11 Bracken Hill Peterlee SR8 2LS
Order Number:	
Manufacturer:	SEAWARD ELECTRONIC
Model:	Sample Multimeter
Description:	Sample Multimeter
Serial Number:	0000
Asset ID:	
Seaward Reference:	183613
Temperature:	20.0°C
Humidity:	40 %RH
Date Received:	28 April 2023
Calibration Date:	28 April 2023
Calibration Category::	A: WITHIN SPECIFICATION AT THE POINTS TESTED, NO ADJUSTMENT NECESSARY

UKAS has Method Statement

Method Statement:

The instrument is calibrated using equipment whose calibration is traceable to recognised national standards. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. All uncertainties shown in this certificate make allowance for display resolution.

UKAS has UKAS Statement

UKAS Statement:

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to SI systems of units and/or to units of measurement realised at the National Physical Laboratory or other recognized national metrology institutes. This certificate applies only to the instrument identified above, and may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Compliance Rules

To determine if the equipment is in compliance with the specification.

The uncertainty of measurement has been taken into account when determining compliance with the specification. An overall statement of compliance is included on page 1 of this certificate. The measurement results and the statement of compliance with specification only relate to the instrument calibrated.

If the specification limit is not exceeded by the measurement result plus the expanded uncertainty (based on a 95 % coverage probability) for any result, then the instrument is in compliance with the specification. See ① below.

If the specification limit is exceeded by the measurement result plus the expanded uncertainty (based on a 95 % coverage probability) for any result, then the instrument is not in compliance with the specification. See ④ below.

Compliance Rules

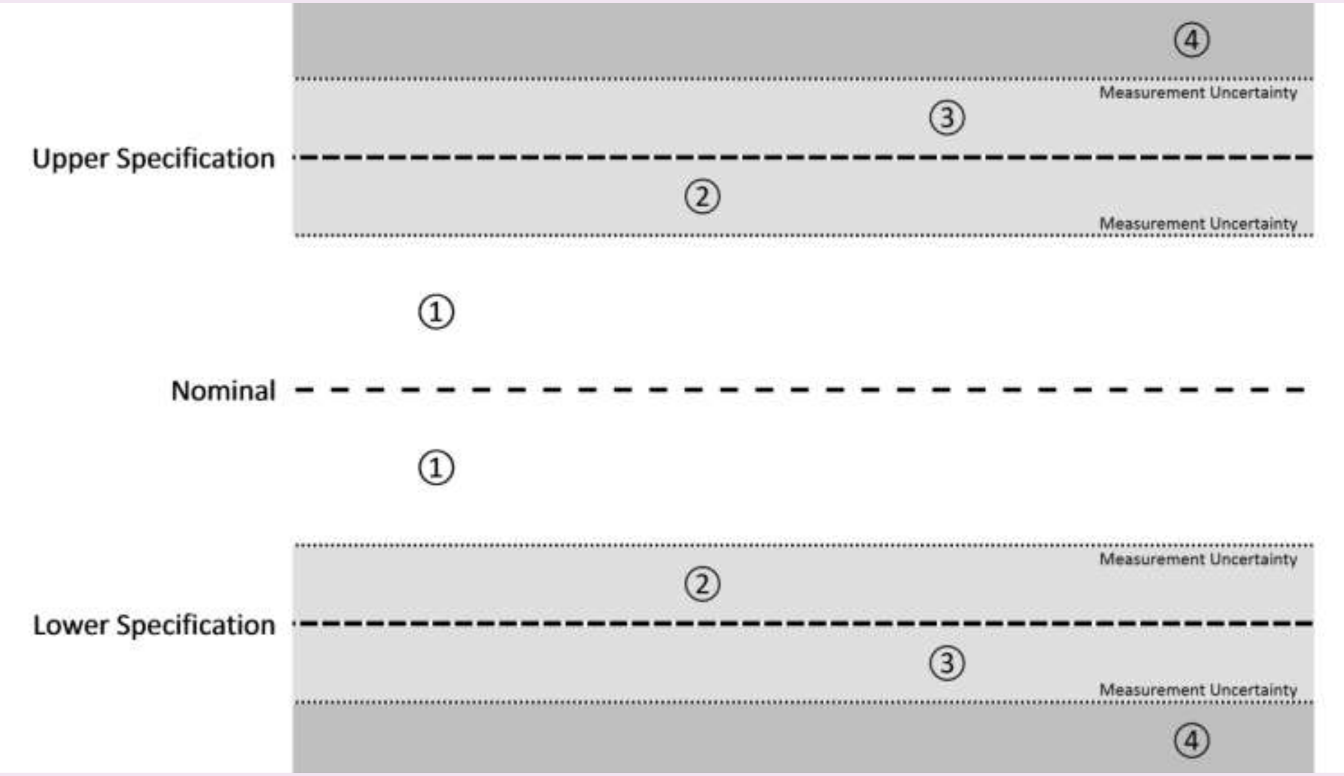
To determine if the equipment is in compliance with the specification.

If the measurement result plus or minus the expanded uncertainty (based on a 95% coverage probability) overlaps the specification limit, then it is not possible to state that the instrument is either in compliance with or not in compliance with the specification. The user must decide whether or not the instrument's performance satisfies their requirements. See ② and ③ below.

NHS

Compliance Rules

To determine if the equipment is in compliance with the specification.



UKAS has more readings including Measurement of Uncertainty

FUNCTION	ACTUAL	BEFORE	AFTER	LIMITS		UNCERTAINTY
DC Voltage Measurement						
200 mV Range	180.0	180.0		179	181	0.10 mV
2 V Range	1.800	1.800		1.79	1.81	0.001 V
20 V Range	2.00	2.00		1.98	2.02	0.010 V
	10.00	10.00		9.94	10.06	0.010 V
	18.00	18.00		17.9	18.1	0.010 V
	-2.00	-2.00		-1.98	-2.02	0.010 V
	-18.00	-18.00		-17.9	-18.1	0.010 V
200 V Range	180.0	180.0		179	181	0.10 V
1000 V Range	900	900		894.5	905.5	1.0 V
AC Voltage Measurement						
200 mV Range @ 50 Hz	180.0	180.0		176.8	183.2	0.20 mV
2 V Range @ 50 Hz	1.800	1.800		1.768	1.832	0.0020 V
20 V Range @ 50 Hz	2.00	2.00		1.92	2.08	0.020 V
	10.00	10.00		9.8	10.2	0.020 V
	18.00	18.00		17.68	18.32	0.020 V
20 V Range @ 400 Hz	18.00	18.00		17.68	18.32	0.020 V
200 V Range @ 50 Hz	180.0	180.0		176.8	183.2	0.20 V
750 V range @ 50 Hz	675	675		659.875	690.125	1.0 V

Traceable must demonstrate traceability

All equipment used to calibrate the item named on this certificate are traceable to National Standards through one or more of the items listed below:

Description:	Certificate No:
Transmille 3041 Multifunction Calibrator TS933	45316
Transmille 3200 Electrical Test Calibrator TS930	45106
Racal 1992 Timer Counter TS789	3208170003
Fluke 8588A Digital Multimeter TS1873	078719
1 Mohm Standard Resistor TS877	147126
100 kohm Standard Resistor TS902	34723
10 kohm Standard Resistor TS878	1-13527378967
1 kohm Standard Resistor TS879	1-12928202204
100 Ohm Standard Resistor	1-12928202252
10 Ohm Standard Resistor TS881	1-13527372299
1 Ohm Standard Resistor TS882	34724
0.1 Ohm Standard Resistor TS883	1-13426176880
0.01 Ohm Standard Resistor TS884	1-11408738850
0.001 Ohm Standard Resistor TS885	1-10679585253
Fluke P3025-BAR-P Deadweight Tester TS1506	01611

Traceable vs UKAS

	Traceable	UKAS (ISO/IEC 17025)
Traceable to National Standards?	Yes	Yes
Traceable to International Standards?	No	Yes
Certificate is an internationally recognised legal document?	No	Yes
Lab equipment used is UKAS calibrated?	Usually	Yes
Lab has ISO 9001 certified quality management system?	Check…	Yes
Calibration procedures are assessed by an independent UKAS auditor?	No	Yes
Lab personnel are assessed for technical competence by an independent UKAS auditor?	No	Yes

Common reasons to choose UKAS

- Safety - when measurement results are critical to the safety of a product or process.
- Regulations – highly regulated industries may demand UKAS quality level e.g. automotive, pharmaceutical.
- Quality – your company Quality Management System may demand UKAS as part of your companies approach to quality.

Common reasons to choose UKAS

- Supply chain – your customers may demand UKAS to assure quality.

- International trade – the international reach of UKAS means a UKAS calibrated product demonstrates quality worldwide.

How often should we calibrate?

- Calibration = peace of mind
- Frequency of calibration = importance of peace of mind
- 1 year mostly - more often for critical equipment
- What would be the impact of incorrect measurement?

Practicalities

Do I have to send my equipment away?

We can't bear to be without it!

Audit Ready

Thank you

Questions?