General Accreditation Guidance

General equipment table

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Purpose

This document provides guidance for establishing calibration and checking intervals for equipment. The information presented should be read in conjunction with the guidance found in the informative annex of the *General Accreditation Criteria: Equipment assurance, in-house calibration and equipment verification*.

Facilities should also refer to the *General Accreditation Criteria: Metrological Traceability Policy*.

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Accelerometer			
Piezoelectric types	3		
		12	Intercomparison
		On use	Against vibration calibrator
Servo, strain gauge and piezoresistive types (zero Hz response)	2	On use	By inversion
Air flow nozzles			
	Initial		
		12	Confirm throat diameter
Anemometers			
	1		Anemometers with rotating parts may be checked regularly for wear, damage and free bearing operation
Angle gauges			
	2 then 4		
Balances			
	3		NMI Monograph 4 EURAMET Calibration Guide 18
		12	Service as required

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
		6	Repeatability check. *General Accreditation Guidance: User checks and maintenance of laboratory balances*
		1	One point check. *General Accreditation Guidance: User checks and maintenance of laboratory balances*
Barometers			
	Initial		
Biological safety cabinets (BSC) Class I and Class II			
	1		AS 2252.4
Callipers			
	2		ISO 13385-1
Dial gauges			
	2		
Digestion blocks **(e.g. blocks or mantles used for Kjeldahl Nitrogen, chemical oxygen demand or metal digestions)**			
		Initial, then 12 and after repair or maintenance	Temperature variation check across working spaces or recovery check with a difficult to digest standard/sample (e.g. nicotinic acid for TKN digestion)
Dimensional Measuring machines			
Coordinate Measuring Machines (CMMs)	2		
		6	Intermediate volumetric check (e.g. ball bar)
Geometric tests	5		
Micrometer heads	3		
Precision scales	10		
Displacement transducers (LVDT)			
	2		

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
		On use	Against length standard
Electrical instruments			
Digital multimeters (DMM), and other types of meters which measure electrical parameters such as volts, resistance, current, capacitance etc (e.g analogue meters, data loggers, chart recorders, Watthour and Varhour meters)	1		Calibrate over all ranges and parameters of use including calibration across frequency (Hz) of use. *General Accreditation Guidance: Electronic measuring equipment as reference standards* EURAMET cg-15
		6	Compare with meters of similar resolution
Environmentally controlled enclosures			
CO_2	On use		Monitor level
Humidity controlled chambers	3		EURAMET cg-20 IEC 60068-3-6 Humidity uniformity characterisation and spatial temperature at multiple test sites covering the working space and working temperature and humidity ranges
		12	Spatial uniformity of temperature
Infrared, ultraviolet and visible	3		
		On use	Check operation of the lamps
Medical refrigeration equipment; blood refrigerators			AS 3864.2
Pressure / vacuum	1		Monitor level
Temperature controlled chambers including incubators, ovens, furnaces, conditioning enclosures (ageing), refrigerators and freezers, water baths	(3 spatial uniformity) (1 temperature indicator)		EURAMET cg-20 Spatial uniformity, IEC 60068 -3-5; over 3 points in the temperature range Temperature indicator as per the type of thermometer used

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
		On use	Monitor temperature at a minimum one point
Extensometers			
Contact and optical	2		AS 1545; grading requirements apply
Feeler gauges			
	2		
Flowmeters			
			EURAMET cg-19
Differential pressure meters, orifice meters, venturi meters and annubar	2	6	Flow or dimensional calibration plus inspection for wear and damage. Associated transducers (temperature, pressure, density) to be calibrated in accordance with that transducer requirement.
Electronic thermal, mass flow	1		Where high temperature or corrosive gases are monitored a shorter interval is recommended
Laminar flow meters	2	6	Inspect for damage or contamination
Positive displacement meters	2		
Provers	2	6	EURAMET cg-21 Thermometer ice points and pressure readout checks for stability
Rotary meter	2	6	Inspect for contamination or damage
Rotameters - variable area meters	2	3	Visual inspection for damage to float edges or ball float for pitting
Soap film	2		
Glass soap film flow meter			See volumetric glassware
Sonic nozzle			
reference 0.1%	3	6	Inspect and clean
working 0.5%	6	6	Inspect and clean

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Turbine meters	2	6	Inspect for contamination or damage of turbine blades, and free bearing operation
Turbine meters (Pelton Wheel / Miniature)	1	6	Inspect for contamination or damage of turbine blades, and free bearing operation
Vortex shedding	2	6	Inspect for contamination of the bluff body
Wet test meters	2	Before use	Set water level before use
Force testing machines			
			EURAMET cg-04
Dead weight	5		AS 2193
Elastic dynamometer	2		AS 2193
Hydraulic, pneumatic	2		AS 2193
		6	Cross head speed (for constant rate of extension machines) and pressure
Fume cupboards (cabinets)			
	1	6	Depending on cabinet type either AS/NZS 2243.8 or AS/NZS 2243.9
Gauge blocks			
	2 then 4 subsequent		
Hygrometers			
Dew or frost point hygrometers	2		
Digital psychrometers (aspirated wet and dry-bulb thermometers)	1		
		6	Compare against a calibrated thermometer at ambient temperature. Inspect the wick for contamination and effective wetting and clean or replace if required

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Electrical impedance humidity probes	1		2 yearly if used only under ambient conditions
Sling and Assmann psychrometers	10		
		6	Compare thermometers at room temperature with wick dry AS 2001.1 Appendix C
Thermohygrographs - hair	1		
		Weekly	Compare against a calibrated psychrometer
Levels (precision)			
	4		
		12	Single point check for electronic levels
Load cells			
	2		AS 2193
		On use	If amplification is variable, perform shunt calibration check
Luminance meters & Illuminance meters			
Analogue	2		
Digital	1		
Manometers			
Electronic	1		
Liquid	10 (mercury) 3 (liquid other than mercury)		Periodically check the cleanliness of the fluid and the cleanliness, shape and freedom of movement of the liquid meniscus
Masses			
Stainless steel, nickel chromium alloy	3		
Other alloy and iron Class III	2		

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
For proof loading purposes	5		Against calibrated load cell (in house) or weighing device, which achieves the specified accuracy
Micrometers (calipers)			
	5		
		1	Zero, one point (against gauge block) and condition of anvils
Optical electronic distance measurement equipment			
	2		
Optical projectors			
	5		
pH meters			
		Daily or on use	Compare against two buffer solutions as per manufacturer's instructions
Pipettes (POVAs)			
			ISO 8655-6
Pressure equipment			
Calibrators	1		Metrology Society of Australia (MSA), Test Method 1
Digital pressure gauges	1		Metrology Society of Australia (MSA), Test Method 1
Industrial gauges subject to shock loading.	6 months		AS 1349 for Bourdon tube types Metrology Society of Australia (MSA), Test Method 2
Industrial gauges not subject to shock loading	1		AS 1349 for Bourdon tube types Metrology Society of Australia (MSA), Test Method 2
Pressure transducers	1		Metrology Society of Australia (MSA), Test Method 1
Pressure transmitters	1		Metrology Society of Australia (MSA), Test Method 1
Radiation thermometers			

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Disappearing filament pyrometers	3		
including Visible and Infrared Pyrometers	2		Initial test of target size dependence should be performed Initial calibration should include sufficient points to confirm linearity
		12	Compare at one point in range or at ice point
Pyrgeometers			
	3		
Sieves			
	Initial		Calibration certificate to ISO 3310-1 or ISO 3310-2
		12	Additional or less frequent checks may be necessary against a reference set or a suitable reference material
Sound measuring devices			
Acoustic calibrators including pistonphones and sound sources	1		IEC 60942
		6	Intercompare
Devices including sound level meters & noise dosimeters	2		IEC 61672-3 for sound level meters
		On use	Compare against acoustic calibrator or pistonphone
Spectrophotometers and spectroradiometers			
		6	Wavelength accuracy, bandpass, absorbance, stray light error, linearity of response, repeatability and matching of cells
		On use	A blank and at least 2 points on the calibration curve to be checked
Tape measures, rulers			

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Steel rulers	Initial		BS 4372
		6	1 point check within operating range
Tape measures and retractable pocket rulers	Initial		
		24 to 60	Compare at maximum length, depending on use and accuracy required
Thermocouples			
			EURAMET cg-08
'Base metal' type, sheathed	2		For use up to 400°C. It is not recommended to recalibrate thermocouples used above 400°C
'Base metal' type, wire	2		For use up to 300°C C. Replace if used above 300°C.
'Rare metal' type	3		3 years or after 100 hours above 500°C, whichever is sooner
Stored reels	10		Reel of wire, 4 samples of wire from end points and middle of reel
Thermocyclers			
	1	12	Information is provided in the *Specific Accreditation Criteria: ISO/IEC 17025 Application Document Calibration - Annex, Temperature metrology*
Thermometers			
Digital - with or without a temperature sensor, hand held or bench type, single and multichannel. temperature loggers	2		

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
		6	Compared against a reference device at the temperature of use. If used at more than one temperature, choose the most critical temperature. Measure at ice point if the facility does not have a reference device. For data loggers the reference device cannot be another data logger of the same type.
Liquid-in-glass	5		
		6	Compare at ice point. Refer to *General Accreditation Guidance: Liquid-in-glass thermometers - selection and use* or against reference thermometer at one point in range
Measuring instrument AC Bridge type, reference and working	5		
Measuring instrument DC bridge type	2		
		6	Compare at ice point
Resistance			NMI Monograph 11
-40°C to 250°C	5		
		6	Compare at ice point
<-40°C and >250°C	2		
		6	Compare resistance at ice point
Timing devices			
Stop watches, clocks (mechanical and electrical devices)		6	Compare using GPS/GNSS directed device
Torque wrenches and Screwdrivers			
	1		ISO 6789-2
		6	In house cross check of overlapping ranges if possible

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Torque transducers			
			EURAMET cg-14
Velocity transducers			
	3		
		24	Compare frequency response and sensitivity
Volumetric glassware			
	Initial (on commissioning) 10 (borosilicate) 5 (soda-lime)		EURAMET cg-19 ISO 4787 ASTM E542, E694 Where glassware is subject to harsh treatment such as high temperatures or corrosive substances the calibration period may need to be reduced.

References

This section lists publications referenced in this document. The year of publication is not included as it is expected that only current versions of the references shall be used.

Australian Standards

AS 1349 *Bourdon tube pressure and vacuum gauges*

AS 1545 *Methods for the calibration and grading of extensometers*

AS 2001.1 *Methods of test for textiles - Conditioning procedures*

AS 2193 *Calibration and classification of force-measuring systems*

AS 2252.4 *Controlled environments - Biological safety cabinets Classes I and II - Installation and use*

AS 3864.2 *Medical refrigeration equipment - For the storage of blood and blood products. Part 2: User-related requirements for care, maintenance, performance verification and calibration*

AS IEC 60942 *Electroacoustics - Sound calibrators*

AS/NZS 2243.8 *Safety in laboratories - Fume cupboards*

AS/NZS 2243.9 *Safety in laboratories - Recirculating fume cabinets*

Other Standards

ASTM E542	*Standard Practice for Calibration of Laboratory Volumetric Apparatus*
ASTM E694-18	*Standard Specification for Laboratory Glass Volumetric Apparatus*
BS 4372	*Specification for engineers' steel measuring rules*
IEC 60068-3-5	*Environmental testing –Part 3-5: Supporting documentation and guidance – Confirmation of the performance of temperature chambers*
IEC 60068-3-6	*Environmental testing - Part 3-6: Supporting documentation and guidance - Confirmation of the performance of temperature/ humidity chambers*
ISO 3310-1	*Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth*
ISO 3310-2	*Test sieves - Technical requirements and testing - Part 2: Test sieves of perforated metal plate*
ISO 4787	*Laboratory glassware - Volumetric instruments - Methods for testing of capacity and for use*
ISO 6789-2	*Assembly tools for screws and nuts - Hand torque tools - Part 2: Requirements for calibration and determination of measurement uncertainty*
ISO 8655-6	*Piston-operated volumetric apparatus - Part 6: Gravimetric methods for the determination of measurement error*
ISO 13385-1	*Geometrical product specification (GPS) Dimensional measuring equipment part 1: Callipers; Design and Metrological characteristics*
ISO/IEC 17025	*General Requirements for the competence of calibration and testing laboratories*
ISO/IEC Guide 99	*International vocabulary of metrology - Basic and general concepts and associated terms (VIM)*

NATA Publications

General Accreditation Criteria

Equipment assurance, in-house calibration and equipment verification

Metrological traceability

General Accreditation Guidance

Electronic measuring equipment as reference standards

Liquid-in-glass thermometers – selection, use and calibration checks

User checks and maintenance of laboratory balances

Specific Accreditation Criteria

Calibration ISO/IEC 17025 annex - temperature metrology

Other Publications

Calibration of Pressure Calibrators, Indicators and Transducers, Test Method 1 - 2008, Metrology Society of Australia (MSA)

Calibration of Pressure Gauges, Test Method 2 - 2008, Metrology Society of Australia (MSA)

EURAMET cg-04	*Uncertainty of Force Measurements*
EURAMET cg-08	*Calibration of Thermocouples*
EURAMET cg-14	*Guidelines on the Calibration of Static Torque Measuring Devices*
EURAMET cg-15	*Guidelines on the Calibration of Digital Multimeters*
EURAMET cg-18	*Guidelines on the Calibration of Non-Automatic Weighing Instruments*
EURAMET cg-19	*Guidelines on the Determination of Uncertainty in Gravimetric Volume Calibration*
EURAMET cg-20	*Guidelines on the Calibration of Temperature and / or Humidity Controlled Enclosures*
EURAMET cg-21	*Guidelines on the Calibration of Standard Capacity Measures using the Volumetric Method*
NMI Monograph 4	*The Calibration of Weights and Balances EC Morris and KMK Fen*
NMI Monograph 11	Platinum Resistance Thermometry

Amendment table

The table below provides a summary of changes made to the document with this issue.

Section or Clause	Amendment
References	The following Australian Standards are no longer available and have been removed: AS 2162.1 Verification and use of volumetric apparatus - General - Volumetric glassware AS 1984 Vernier callipers (metric series)

Balances	EURAMET Calibration Guide 18 has been included.
Barometers	General Accreditation Guidance: In-situ calibration of barometers has been removed as it is no longer available.
Callipers	Removed AS 1984 and replaced with ISO 13385-1
Environmentally controlled enclosures	IEC 60068-1; 60068-2-38; 60068-2-39 have been replaced by IEC 60068-3-6 - Environmental testing - Part 3-6: Supporting documentation and guidance - Confirmation of the performance of temperature/ humidity chambers IEC 60068-3-5 - Environmental testing –Part 3-5: Supporting documentation and guidance – Confirmation of the performance of temperature chambers
Flowmeters	Included glass soap film flow meter
Sieves	Updated references i.e. removed BS 410.1 or BS 410.2 and replaced with ISO 3310-1 or ISO 3310-2
	Minor editorials have also been made.