

# **General Accreditation Guidance**

# **General equipment table**

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## General equipment table

### 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	d Class II	
	1		AS 2252.4
Callipers			
	2		ISO 13385-1
Dial gauges			
	2		
Digestion blocks			
(e.g. blocks or mantles used	for Kjeldahl Nitroge	en, chemical oxyge	en 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 m	achines		
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			
<b>Digital multimeters</b> (DMM), and other types of meters which measure electrical parameters such as volts, resistance,	1		Calibrate over all ranges and parameters of use including calibration across frequency (Hz) of use.
current, capacitance etc (e.g analogue meters, data loggers, chart			General Accreditation Guidance: Electronic measuring equipment as reference standards
recorders, Watthour and Varhour meters)			EURAMET cg-15
		6	Compare with meters of similar resolution
Environmentally controlle	d enclosures		
CO <sub>2</sub>	On use		Monitor level
Humidity controlled	3		EURAMET cg-20
cnambers			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	(3 spatial		EURAMET cg-20
chambers including uniformity) incubators, ovens, furnaces, conditioning enclosures (ageing)	uniformity)		Spatial uniformity, IEC 60068 -3-5; over 3 points in the temperature range
refrigerators and freezers, water baths	(1 temperature indicator)		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	5)		
	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	1		
(aspirated wet and dry- bulb thermometers)			
		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 & Illum	inance 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	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	e measurement e	quipment	
	2		
Optical projectors			
	5		
pH meters	L	I	
		Daily or on use	Compare against two buffer solutions as per manufacturer's instructions
Pipettes (POVAs)			
			ISO 8655-2
			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	6 months		AS 1349 for Bourdon tube types
to shock loading.			Metrology Society of Australia (MSA), Test Method 2
Industrial gauges not	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

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Radiation thermometers			
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 s	spectroradiomete	rs	·
		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

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
Tape measures, rulers			
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. 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 Scre	ewdrivers		
	1		ISO 6789-2
		6	In house cross check of overlapping ranges if possible
Torque transducers			

Item of equipment	Calibration interval (years)	Checking interval (months)	General comments and example reference standards
			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 8655-2	Piston-operated volumetric apparatus - Part 2: Pipettes
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 User checks and maintenance of laboratory balances

<u>Specific Accreditation Criteria</u> 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	<i>Guidelines on the Determination of Uncertainty in Gravimetric</i> <i>Volume Calibration</i>
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	NATA Publications, General Accreditation Guidance:
	Liquid-in-glass thermometers – selection, use and calibration checks has been removed.
	ISO 8655 Piston-operated volumetric apparatus - Part 2:Pipettes has been included.
Pipettes (POVAs)	Inclusion of ISO 8655-2
Liquid-in-glass	Removal of Liquid-in-glass thermometers – selection, use and calibration checks.
Whole document	Addition of Security Classification Label