ACCREDITATION SCHEME FOR LABORATORIES

Technical Notes MECH 001
Specific Requirements for Mechanical Testing Laboratories

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The SAC Accreditation Programme is managed by Enterprise Singapore

1. Introduction

1.1 The field of Mechanical Testing covers a wide range of tests and is divided into the following broad areas:

- Tests on materials
- Tests on products
- Tests on assemblies, engineering plants and structures
- Aerodynamic, hydraulic and pneumatic tests
- Metallographic tests except chemical analysis

1.2 These Technical Note should be read in conjunction with documents SAC 01 "Terms and Conditions for Accreditation" and ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories".

1.3 Supplementary information for specific areas of testing within the Mechanical Testing field may be published as other Technical Notes.

2. Testing Machines

2.1 All testing machines shall be of appropriate types for the particular tests to be performed and each shall be of a suitable capacity. Where applicable, the testing machine shall be capable of applying the required load at continuous defined speeds until no greater load can be sustained.

2.2 The readability, accuracy and repeatability of testing machines shall comply with the requirements of the appropriate standard for which accreditation is sought.

3. Calibration of Equipment

3.1 Table 1 in this document sets out the normal frequencies for calibrations and performance checks of general equipment used in the field of Mechanical Testing.

3.2 These frequencies are generally considered to be the minimum appropriate, unless the other criteria specified below are met:

(a) the equipment is of good quality and of proven stability, and

(b) the laboratory has both the equipment capability, competent staff and expertise to perform adequate internal checks, and

(c) in the event of any suspicion or indication of overloading or mishandling of equipment, there shall be a process put in place to show that the stability has not been impaired.

3.3 Where the criteria in 3.2 cannot be met or the relevant test standards have specified more stringent requirements, Table 1 or the more stringent requirements, whichever is more stringent shall be adopted.

3.4 Submissions for extension of calibration intervals based on factors such as history of stability, frequency of use, accuracy required and ability of staff to perform regular checks may be considered. It is the responsibility of the testing laboratory to provide evidence that its calibration system would ensure that confidence in the equipment could be maintained.

3.5 Sensitive equipment such as balances, force, impact and hardness testing machines shall be rechecked or recalibrated if they are moved.

4. Requirements for Tests On Metals

4.1 Hardness Testing

4.1.1 The laboratory shall do a performance check on each day before each type of hardness tests. Records of such check shall be documented.

4.1.2 The check shall be at forces similar to those involved in the tests to be conducted. So far as is practicable the hardness values involved shall match those involved. Laboratories shall have an adequate range of blocks to cover the range of hardness and the forces normally encountered.

4.1.3 For Vickers and Rockwell hardness tests, laboratories may use non-calibrated indenters provided those indenters have been checked by performance tests on hardness blocks with assigned values and by inspection at a magnification of at least 50x.

4.1.4 Hardness blocks with assigned values from established block manufacturers (such as Vickers, Avery, Wilson and Yamamoto) shall be used for the yearly partial calibration.

4.1.5 Test reports shall state the source of calibration blocks.

TABLE 1 RECOMMENDED EQUIPMENT CALIBRATION INTERVALS

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
1.	Accelerometers	1 year		
2.	Anemometers	1 year		
3.	Balances	1 year In addition: i) * Each weighing ii) * Monthly iii) * Half yearly	i) Zero check ii) One point check using known mass close to sample weight iii) Repeatability, linearity or accuracy	Reference mass to be calibrated every three years For repeatability of reading, ten weighing are made of mass having a value close to the maximum load of balance
4.	Barometers	3 months (single point)		Telephone comparison with meteorology department
5.	Dial gauges	1 year		
6.	Dies and cutters (For preparation of test specimens such as dumbbell specimen)		Full dimensional check whenever sharpen	Frequent examination for damage

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7.	Environmental chambers	1 year	Temperature and humidity variation	
8.	Extensometers a) Lever and mirror type b) Micrometer screw type c) Dial indicator type d) Recording types with electrical output	 1 year 1 year 1 year 1 year		
9.	Flow Meters a) Gas b) Air c) Water	 1 year 1 year 1 year		
10.	Force Measuring Device (proving ring, transducer or load cell)	1 year		
11.	Force Testing Machine (Tension, Compression, Universal) Type 1 – <u>Mechanical Force Measuring System</u> a) Dead weight b) Knife edge, lever and steelyard	 3 years 1 year		

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
	c) Pendulum dynamometer	1 year		
	d) Elastic dynamometer (e.g. spring, ring with dial gauge)	1 year		
	<u>Type 2 – Hydraulic or Pneumatic Force Measuring Systems</u>			
12.	a) Mechanical system incorporating a pneumatic or a hydraulic link (e.g. proportional cylinder)	1 year		
	b) Bourdon Tube or diaphragm gauge	1 year		
	c) Bourdon Tube or diaphragm gauge fitted with a master gauge which can be disconnected during normal testing	1 year		
	d) Bourdon Tube or diaphragm gauge use only as a null detector for a mechanical system	1 year		
	e) Bourdon tube with electrical transducer	1 year		

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
	Type 3 – Electrical Force Measuring System	1 year		
13.	Gauge Blocks a) Reference standards b) Working equipment	 4 years 2 years		
14.	Hardness Testers for Metals a) Brinell, Vickers and Rockwell (including portable machine) b) Portable Brinell Microscopes c) Diamond indenters	 * 1 year – Indirect verification For performance check, refer to clause 4.1.1 1 year (with calibrated graticule) 1 year (inspection)		
15.	Hardness Tester for Rubber, Plastics and Ebonite a) Dead weight tester for rubber b) Dead weight tester for plastic c) Meters (durometers) for rubber	 3 years 3 years 1 year Frequent checks by user on reference hardness blocks		

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16.	Hygrometers and Psychrometers a) Assman hygrometers and sling type hygrometers b) Recorders (accuracy of ± 1% RH) c) Other recorder including hair types	5 years 2 years 1 year		
17.	Impact Testing Machine (Pendulum Testing) a) Charpy Impact Tester (Metals) b) Izod and Universal Impact Testers (Metals) c) Charpy and Izod Impact Testers (Plastics) d) Notching tools	) Frequent) inspection by) user)) * 1 year –) Indirect) verification)))	Annual visual check on striker and anvil for wear and tear	Check regularly and whenever reground
18.	Linear Variable Differential Transducers (LVDTS)	* Daily or whenever used 1 year complete calibration	Check against length standards	

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
19.	Length Measuring Devices a) Steel Rule b) Vernier calipers c) Micrometer	 Initial 5 years (Reference) 1 year * Routine checks monthly or less depending on use 1 year * Routine checks monthly or less depending on use	 Check anvil for flatness	
20.	Manometers	1 year		
21.	Orifice Plates	Initial * 6 months	Visual inspection for damage, wear or contamination	
22.	Ovens	1 year		
23.	Pressure and Vacuum Gauges a) Working gauges subjected to shock loading	 6 monthly or less depending on use		

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	b) Working gauges not subjected to shock loading	1 year		
24.	Stop watches and clocks	* 3 months		Comparison against the Singapore Standard Time over at least ten minutes
25.	Strain Meters	* 6 months		Using stop watch
26.	Tachometers	1 year		
27.	Thermohygrograph	1 year		
28.	Thickness Gauges	1 year		
29.	Thermometers a) Liquid-in-glass b) Electronic	 2 years * 1 year 1 year	Checks at ice-points and at one point within the working range	
30.	Thermocouples	Initial * 6 month	Replace or perform inhomogeneity test	<u>Inhomogeneity Test</u> Use an oil bath with temperature set at the working temperature. Immerse the thermocouple at different depth by moving it slowly while recording the output. A sudden change at the output indicates a change in the

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				seebeck coefficient in the wire. A high quality wire will have the seebeck coefficient almost the same anywhere along the wire. The wire will then be considered as homogeneous. Reference: Traceable Temperature, An Introduction to the Temperature Measurement and Calibration, 2nd edition by J.V. Nicholas and D.R. White

Note:

1) An * in the table denotes those equipment calibration that may be carried out by the staff of a laboratory if it is suitably equipped and the staff competent to perform such calibrations / checks.

2) Where calibrations have been performed by the staff of a laboratory, adequate records of these measurements shall be maintained.