



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM21012A Service and repair mechanical watch oscillating systems**

**Release: 1**

## MEM21012A Service and repair mechanical watch oscillating systems

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	<p>This unit of competency covers servicing and repair techniques and procedures for balance staff replacement of mechanical watch oscillating systems and components. It also includes workshop techniques for removal of balance staffs, rollers and balance springs. Additionally, this unit covers techniques for inspection, assessment and adjustment of balance wheel trueness and poise, balance spring, in-beat, oscillator end shakes and servicing of shock protection devices.</p>
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### Application of the Unit

<b>Application of the unit</b>	<p>This unit of competency applies to service and repair work undertaken by a watch repair tradesperson on watch oscillating systems. Work would normally be undertaken in watch service and repair centres and jewellery stores where service and repairs are offered.</p> <p>This unit has been developed for watch service and repair apprenticeship training and the recognition of trade-level skills in watch servicing and repair.</p> <p>Band: A</p> <p>Unit weight: 4 points</p>
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### Licensing/Regulatory Information

Not Applicable

## Pre-Requisites

Prerequisite units		
	MEM21009A	Inspect, diagnose, adjust and repair mechanical watches
	MEM21008A	Service mechanical watches
	MEM18001C	Use hand tools

## Employability Skills Information

Employability skills	This unit contains employability skills.
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## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify oscillator types	1.1. Identify oscillating construction types and components 1.2. Establish the performance characteristics of the watch oscillating system 1.3. Record and document repair requirements
2. Diagnose oscillator condition	2.1. Select and use workshop tools and equipment appropriately 2.2. Inspect oscillator components for condition, function, end shake and performance 2.3. Record and report wear and damage to component parts 2.4. Determine appropriate repair process to rectify faults
3. Repair, replace and adjust oscillator components	3.1. Remove and reassemble balance complete and oscillator components using appropriate tools, equipment and techniques 3.2. Determine type and method of balance staff removal and replacement 3.3. Test security of replacement balance staff and oscillator components 3.4. Inspect condition and adjust balance wheel and oscillator components for correct operation 3.5. Determine type of roller and roller jewel and the method of removal and replacement procedures 3.6. Inspect, diagnose and adjust balance spring to achieve optimum performance and timekeeping 3.7. Inspect, service and replace components for shock protection devices fitted to mechanical oscillators
4. Test and adjust oscillator	4.1. Verify and confirm function of watch movement 4.2. Correctly set up and operate mechanical watch timing machine and interpret readings 4.3. Verify watch performance and timekeeping 4.4. Adjust in-beat and rate, as required, according to performance and design characteristics

## Required Skills and Knowledge

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit.

**Required skills**

Required skills include:

- identifying types and grades of mechanical watch balance complete
- removing and replacing balance staffs and rollers
- truing balance wheels
- poising balance wheels (static)
- inspecting, diagnosing and adjusting balance springs
- adjusting in-beat and rate
- setting up and operating mechanical watch timing machine

**Required knowledge**

Required knowledge includes:

- types and grades of balance wheel construction
- types of balance staffs construction
- types of balance spring construction
- types of rollers and roller jewels construction
- balance staff replacement techniques and workshop procedures
- performance characteristics of balance wheel completes
- balance spring adjusting techniques
- watch servicing procedures and techniques
- occupational health and safety (OHS) regulations and procedures

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.</p>	
<p><b>Overview of assessment</b></p>	<p>A person who demonstrates competency in this unit must be able to service, inspect and adjust mechanical watch oscillating systems, including balance staff replacement, to industry standards, manufacturer specifications and in accordance with safety regulations and procedures.</p>
<p><b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b></p>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> <li>• identify different types and grades of mechanical watch oscillating systems</li> <li>• diagnose faults in mechanical watch oscillating systems</li> <li>• inspect and repair faults in mechanical watch oscillating systems</li> <li>• repair a mechanical watch with broken or worn balance staff</li> <li>• inspect and adjust oscillator components for optimum performance.</li> </ul>
<p><b>Context of and specific resources for assessment</b></p>	<ul style="list-style-type: none"> <li>• Assessment may occur on the job or in an appropriately simulated environment. Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and information on workplace practices and OHS practices.</li> <li>• Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</li> <li>• Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.</li> </ul>
<p><b>Method of assessment</b></p>	<ul style="list-style-type: none"> <li>• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.</li> <li>• Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with</li> </ul>

<b>EVIDENCE GUIDE</b>	
	<p>application of underpinning knowledge.</p> <ul style="list-style-type: none"> <li>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application.</li> <li>• Assessment may be applied under project-related conditions (real or simulated) and require evidence of process.</li> <li>• Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</li> <li>• Assessment may be in conjunction with assessment of other units of competency where required.</li> </ul>
<b>Guidance information for assessment</b>	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

## Range Statement

<b>RANGE STATEMENT</b>	
<p>The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.</p>	
<b>Oscillator construction types</b>	<p>Oscillating construction types may include:</p> <ul style="list-style-type: none"> <li>• roskoph</li> <li>• nickel</li> <li>• glycodur</li> <li>• chronometer</li> <li>• 2, 3, 4 arms</li> <li>• bi-metal compensating</li> <li>• annular</li> <li>• balance spring (e.g. flat and overcoil)</li> <li>• tourbillion</li> </ul>

<b>RANGE STATEMENT</b>	
<b>Performance characteristics</b>	<p>Performance characteristics may include:</p> <ul style="list-style-type: none"> <li>• timing, certified chronometer</li> <li>• effects of temperature, shocks, magnetism and position of wear</li> <li>• temperature compensation</li> </ul>
<b>Record and document repair</b>	<p>Record and document repair may include:</p> <ul style="list-style-type: none"> <li>• extent and date of repair</li> <li>• cost of replacement part</li> <li>• time spent on procedure</li> </ul>
<b>Workshop tools and equipment</b>	<p>Workshop tools and equipment may include:</p> <ul style="list-style-type: none"> <li>• hand tools</li> <li>• levers (e.g. balance spring)</li> <li>• roller removing tool</li> <li>• staking set</li> <li>• watchmaker's lathe</li> <li>• balance wheel truing tool</li> <li>• poising tool</li> <li>• figure of eight calipers</li> <li>• spirit lamp</li> <li>• presto roller jewel fitting tool</li> </ul>
<b>Oscillator components</b>	<p>Oscillator components may include:</p> <ul style="list-style-type: none"> <li>• balance wheel</li> <li>• balance spring</li> <li>• balance staff</li> <li>• roller</li> <li>• roller jewel</li> </ul>
<b>Type of construction</b>	<p>Type of construction may include:</p> <ul style="list-style-type: none"> <li>• balance staff (e.g. friction fitted, riveted and screwed)</li> <li>• roller (e.g. single table, double table, incabloc and two piece)</li> <li>• roller jewel shape (e.g. D shape, triangular and elliptical)</li> <li>• balance spring (e.g. flat, overcoil, helical, spherical and conical)</li> </ul>
<b>Wear and damage</b>	<p>Wear and damage may include:</p> <ul style="list-style-type: none"> <li>• balance staff pivots bent, scored or worn</li> </ul>



<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• balance wheel out of true, damaged or enlarged hole</li> <li>• roller tables deformed or damaged</li> <li>• roller jewel cracked, chipped or missing</li> <li>• balance spring centred flat, at the cock and collet</li> </ul>
<b>Appropriate repair process</b>	<p>Appropriate repair process may include:</p> <ul style="list-style-type: none"> <li>• consideration of component cost and availability</li> <li>• replace balance complete</li> <li>• replace balance staff</li> <li>• repair or replace balance spring</li> <li>• repair or replace roller</li> <li>• dismantling and reassembling techniques</li> <li>• inspections adjustments of components</li> <li>• lubrication techniques, type and quantity</li> <li>• use of stop oil treatments (e.g. Epilame and Fixodrop)</li> </ul>
<b>Type and method of balance staff removal and replacement</b>	<p>Type and method of balance staff removal and replacement may include:</p> <ul style="list-style-type: none"> <li>• friction fit</li> <li>• riveted</li> <li>• screwed</li> <li>• turning rivet/hub on lathe</li> <li>• knock out staking set (e.g. platax tool)</li> <li>• grinding molfre tool</li> <li>• shock-resistance (e.g. incabloc)</li> </ul>
<b>Correct operation</b>	<p>Correct operation may include:</p> <ul style="list-style-type: none"> <li>• balance staff secure fitting/tightness</li> <li>• roller aligned and secure</li> <li>• balance wheel true</li> <li>• balance wheel static poised</li> <li>• balance spring stud location in-beat</li> <li>• balance spring adjusting</li> <li>• balance staff end shakes</li> </ul>
<b>Type of roller and roller jewel</b>	<p>Type of roller and roller jewel may include:</p> <ul style="list-style-type: none"> <li>• single table</li> <li>• double table</li> </ul>

<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• two piece</li> <li>• shock-resistance (e.g. incabloc)</li> <li>• D shaped, triangular or elliptical roller jewels</li> </ul>
<b>Shock protection devices</b>	Shock protection devices may include: <ul style="list-style-type: none"> <li>• operating principles</li> <li>• components (e.g. jewels, endstones, combined setting and shock spring)</li> <li>• types of construction (e.g. incabloc, Kif, Seiko, Citizen and Wyler)</li> </ul>
<b>Watch performance</b>	Watch performance may include: <ul style="list-style-type: none"> <li>• in-beat 0.5 ms</li> <li>• amplitude (e.g. minimum 220 - 270 degrees, variations in positional errors)</li> <li>• rate +/- 5 - 10 seconds a day</li> </ul>

### Unit Sector(s)

<b>Unit sector</b>	Horology
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### Co-requisite units

<b>Co-requisite units</b>	

### Competency field

<b>Competency field</b>	
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