



Australian Government

MEM21012 Service and repair mechanical watch oscillating systems

Release: 1

MEM21012 Service and repair mechanical watch oscillating systems

Modification History

Release 1. Supersedes and is equivalent to MEM21012A Service and repair mechanical watch oscillating systems

Application

This unit of competency defines the skills and knowledge required to apply service and repair techniques and procedures for balance staff replacement of mechanical watch oscillating systems and components.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: A

Unit weight: 4

Pre-requisite Unit

MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21008	Service mechanical watches
MEM21009	Inspect, diagnose, adjust and repair mechanical watches

Competency Field

Horology

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
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1	Determine job	1.1	Follow standard operating procedures (SOPs)
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Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
	requirements	1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, job sheets or work instructions
2	Identify oscillator types	2.1	Identify oscillating construction types and components
		2.2	Establish the performance characteristics of the watch oscillating system
		2.3	Record and document repair requirements
3	Diagnose oscillator condition	3.1	Select and use appropriate workshop tools and equipment
		3.2	Inspect oscillator components for condition, function, end shake and performance
		3.3	Record and report wear and damage to component parts
		3.4	Determine appropriate repair process to rectify faults
4	Repair, replace and adjust oscillator components	4.1	Remove and reassemble balance complete and oscillator components using appropriate tools, equipment and techniques
		4.2	Determine type and method of balance staff removal and replacement
		4.3	Test security of replacement balance staff and oscillator components
		4.4	Inspect condition and adjust balance wheel and oscillator components for correct operation
		4.5	Determine type of roller and roller jewel and the method of removal and replacement procedures

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| | | 4.6 | Inspect, diagnose and adjust balance spring to achieve optimum performance and timekeeping |
| | | 4.7 | Inspect, service and replace components for shock protection devices fitted to mechanical oscillators |
| 5 | Test and adjust oscillator | 5.1 | Verify and confirm function of watch movement |
| | | 5.2 | Set up and operate mechanical watch timing machine and interpret readings |
| | | 5.3 | Verify watch performance and timekeeping |
| | | 5.4 | Adjust in-beat and rate, as required, according to performance and design characteristics |

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Oscillator construction types include one (1) or more of the following:

- roskoph
- nickel
- glycudur
- chronometer
- 2, 3, 4 arms
- bi-metal compensating
- annular
- balance spring
- tourbillion

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Oscillator components include one (1) or more of the following:

- balance wheel
- balance spring
- balance staff
- roller
- roller jewel

Performance characteristics include one (1) or more of the following:

- timing and certified chronometer
- effects of temperature, shocks, magnetism and position of wear
- temperature compensation

Record and document repair includes one (1) or more of the following:

- extent and date of repair
- cost of replacement part
- time spent on procedure

Workshop tools and equipment include the following:

- hand tools
- levers
- roller removing tool
- staking set
- watchmaker's lathe
- balance wheel truing tool
- poising tool
- figure of eight calipers
- spirit lamp
- presto roller jewel fitting tool

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Type of construction includes one (1) or more of the following:

- balance staff:
 - friction fitted
 - riveted
 - screwed
- roller:
 - single table
 - double table
 - incabloc
 - two piece
- roller jewel shape:
 - D shape
 - triangular
 - elliptical
- balance spring:
 - flat
 - overcoil
 - helical
 - spherical
 - conical

Wear and damage includes one (1) or more of the following:

- balance staff pivots bent, scored or worn
- balance wheel out of true, damaged or enlarged hole
- roller tables deformed or damaged
- roller jewel cracked, chipped or missing
- balance spring centred flat, at the cock and collet

Appropriate repair process includes one (1) or more of the following:

- consideration of component cost and availability
- replace balance complete and balance staff
- repair or replace balance spring and roller
- dismantling and reassembling techniques
- inspections adjustments of components
- lubrication techniques, type and quantity
- use of stop oil treatments

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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| Type and method of balance staff removal and replacement includes one (1) or more of the following: | <ul style="list-style-type: none"> • friction fit • riveted • screwed • turning rivet/hub on lathe • knock out staking set • grinding molfre tool • shock-resistance |
| Correct operation includes one (1) or more of the following: | <ul style="list-style-type: none"> • balance staff secure fitting/tightness • roller aligned and secure • balance wheel true and static poised • balance spring stud location in-beat • balance spring adjusting and balance staff end shakes |
| Type of roller and roller jewel includes one (1) or more of the following: | <ul style="list-style-type: none"> • single and double tables • two piece, shock-resistance • D shaped, triangular or elliptical roller jewels |
| Components of shock protection devices include one (1) or more of the following: | <ul style="list-style-type: none"> • jewels • endstones • combined setting • shock spring |
| Watch performance includes one (1) or more of the following: | <ul style="list-style-type: none"> • in-beat 0.5 ms • amplitude (minimum 220 – 270 degrees, variations in positional errors) • rate +/- 5 – 10 seconds a day |

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM21012A Service and repair mechanical watch oscillating systems

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM21012 Service and repair mechanical watch oscillating systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- liaising with customer, verifying condition and performance, and identifying repair costs
- identifying different types and grades of mechanical watch oscillating systems
- diagnosing faults in mechanical watch oscillating systems for wear and damage and determining appropriate repair action
- inspecting and repairing faults in mechanical watch oscillating systems using appropriate workshop tools and equipment
- repairing a mechanical watch with broken or worn balance staff utilising type and method of balance staff removal and replacement
- inspecting and adjusting oscillator components for optimum performance in accordance with specifications
- recording and documenting repairs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- 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
- operating principles of shock protection devices
- construction of shock protection devices
- watch servicing procedures and techniques.

Assessment Conditions

- Assessors must:
 - have vocational competency in servicing and repairing mechanical watch oscillating systems at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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