



Australian Government

MEM21015 Perform precision watch timing and adjustment

Release: 1

MEM21015 Perform precision watch timing and adjustment

Modification History

Release 1. Supersedes and is equivalent to MEM21015A Perform precision watch timing and adjustment

Application

This unit of competency defines the skills and knowledge required to make fine adjustments to high-grade mechanical watches in order to achieve precision timing (chronometer performance).

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

Band: A

Unit weight: 6

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
MEM21012	Service and repair watch oscillating systems
MEM21013	Service, test and adjust watch escapements

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 servicing requirements and liaise with customer	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Identify high-grade mechanical watch characteristics
		1.4	Prepare written quotation and inform customer of watch condition and performance concerns, outlining recommended service procedures to be undertaken to remedy identified faults and accuracy of timekeeping
		1.5	Verify and agree on servicing requirements with customer
		1.6	Prepare watch for handover
		1.7	Record and document repair process
2	Analyse watch performance	2.1	Establish an appropriate clean and safe work environment
		2.2	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		2.3	Use hand tools and equipment in safe and correct manner
		2.4	Handle components without damaging or marking
		2.5	Assess condition and ability of watch to achieve chronometer performance
		2.6	Conduct performance analysis of mechanical watch
		2.7	Adapt servicing techniques to meet manufacturer performance specifications (chronometer certified rating)
		2.8	Assess oscillator and balance spring condition
		2.9	Analyse positional errors in mechanical watch
3	Adjust	3.1	Adjust mechanical watch to minimise positional errors

Elements describe the essential outcomes.

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

	mechanical watch performance	3.2	Adjust mechanical watch to minimise variations in balance amplitude/performance/rate
		3.3	Adjust oscillator and balance spring to minimise positional errors and perform dynamic poising
		3.4	Repeat and confirm all adjustments
4	Test mechanical watch function and performance	4.1	Verify instantaneous watch performance and rate testing
		4.2	Perform longitudinal testing to confirm watch performance
		4.3	Determine intermittent timing faults and adjustments

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.

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High-grade mechanical watch characteristics include one (1) or more of the following:

- finish of components:
 - bevelling
 - graining
 - level of polish
- type of materials used for movement and case construction:
 - non-magnetic alloys
 - precious metals
- quality of components used:
 - balance spring
 - escapement
 - balance wheel
- certification chronometer
- brand name
- number of jewels

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

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

Performance analysis includes one (1) or more of the following:

- watch subjected to various testing positions:
 - dial up
 - dial down
 - crown up
 - crown down
 - crown right
 - left
- states of winding:
 - partly wound
 - half wound
 - fully wound
- temperature variation
- factors affecting isochronism (equal time of vibration)

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Oscillator and balance spring condition includes one (1) or more of the following:

- static poise of balance wheel:
 - balance spring condition
 - concentric
 - flatness
 - beating evenly between curb pins

Dynamic poising includes one (1) or more of the following:

- set up and determine out-of-poise/balance wheel using a timing machine
- identify and locate point of adjustment
- methods of adjustment (with cutters or milling tools)

Confirm all adjustments includes the following:

- ensuring required accuracy is obtained and timekeeping is in accordance with manufacturer specifications

Watch performance and rate testing includes one (1) or more of the following:

- in-beat
- rate adjustment
- amplitude
- effect or influence of escapement
- temperature
- effect of positional errors
- effect of balance wheel poise
- effect of balance spring
- states of winding

Longitudinal testing includes the following:

- testing over extended time period by wearing or simulator machine

Hand tools and equipment include one (1) or more of the following:

- mechanical watch timing machine
- poising tools
- balance wheel cutters
- case opening and closing tools

Working environment includes the following:

- clean bench and working area
- adequate lighting and ventilation
- tools and equipment organised and in good condition
- ergonomic seating

Unit Mapping Information

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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 MEM21015 Perform precision watch timing and adjustment

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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 and safe work practices
- identifying high-grade mechanical watch characteristics
- liaising with customer and verifying condition and performance
- identifying repair costs and preparing written quotation for service/repair
- servicing high-grade mechanical watches to achieve original manufacturer timekeeping standards and specifications in an appropriate work environment
- using appropriate hand tools and equipment to carry out precision watch timing and adjustments
- conducting watch performance testing and longitudinal testing
- analysing and interpreting results of watch performance testing and adjusting and rectifying errors in watch oscillating system
- conducting dynamic poising adjustment of balance wheel
- 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 of high-grade mechanical watches by brand and complications
- characteristics of high-grade mechanical watch movements/components
- timekeeping accuracy for chronometers
- watch construction and components
- oscillator pivot friction and end shake adjustment
- positional error variation adjustments for mechanical watches
- balance amplitude/performance/rate variation adjustments for mechanical watches
- influence of out-of-poised balance wheel
- influence of the escapement on timekeeping
- influence of the balance spring design/characteristics on timekeeping
- balance spring inspection and adjustment techniques

- performance testing procedures for mechanical watches
- factors affecting isochronism
- workshop procedures for conducting dynamic poising.

Assessment Conditions

- Assessors must:
 - have vocational competency in performing precision watch timing and adjustment 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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