



Australian Government

Department of Education, Employment and Workplace Relations

MEM21015A Perform precision watch timing and adjustment

Release: 1

MEM21015A Perform precision watch timing and adjustment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency covers making fine adjustments to high-grade mechanical watches in order to achieve precision timing (chronometer performance).
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Application of the Unit

Application of the unit	This unit applies to precision timing and adjustment work undertaken by a watch repair tradesperson on high-grade mechanical watches. Work would normally be undertaken in watch service and repair centres and jewellery stores where service and repairs are offered. This unit has been developed for watch service and repair apprenticeship training and the recognition of trade-level skills in watch servicing and repair. Band: A Unit weight: 6 points
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
	MEM21013A	Service, test and adjust watch escapements

Prerequisite units		
	MEM21012A	Service and repair watch oscillating systems
	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. Establish servicing requirements and liaise with customer	1.1. Identify high-grade mechanical watch characteristics 1.2. Prepare written quotation and inform customer of watch condition and performance concerns, outlining recommended service procedures to be undertaken to remedy identified faults and timekeeping accuracy 1.3. Verify and agree on servicing requirements with customer 1.4. Prepare watch for handover 1.5. Record and document repair process
2. Analyse watch performance	2.1. Assess condition and ability of watch to achieve chronometer performance 2.2. Conduct performance analysis of mechanical watch 2.3. Adapt servicing techniques to meet manufacturer performance specifications (chronometer certified rating) 2.4. Assess oscillator and balance spring condition 2.5. Analyse positional errors in mechanical watch
3. Adjust mechanical watch performance	3.1. Adjust mechanical watch to minimise positional errors 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
5. Apply industry workshop standards to perform work	5.1. Use hand tools and equipment safely and correctly 5.2. Handle components without damaging or marking 5.3. Establish a clean and safe work environment

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

REQUIRED SKILLS AND KNOWLEDGE

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

Required skill

Required skills include:

- setting up, using and interpreting readings of a mechanical watch timing machine
- conducting performance testing analysis for mechanical watches
- performing fine dexterous adjustments to oscillator components
- using tweezers to manipulate and adjust balance springs for optimum performance
- conducting dynamic poising adjustment of balance wheel complete

Required knowledge

Required knowledge includes:

- 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
- 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
- occupational health and safety (OHS) regulations and procedures

Evidence Guide

EVIDENCE GUIDE

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.

Overview of assessment

A person who demonstrates competency in this unit must be able to adjust high-grade mechanical watches to achieve chronometer timekeeping to industry standards, manufacturer specifications and in accordance with safety regulations and procedures.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors must be satisfied that the candidate can competently and consistently:

- service high-grade mechanical watches to achieve original manufacturer timekeeping standards and specifications
- conduct watch performance testing (e.g. chronometer rating)
- analyse and interpret results of watch performance testing
- adjust and rectify errors in watch oscillating system to achieve precision timing and chronometer performance +/- 4 to 5 seconds per/day.

Context of and specific resources for assessment

- 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.
- Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
- 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.

Method of assessment

- Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.
- Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with

EVIDENCE GUIDE	
	application of underpinning knowledge. • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • 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. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	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

RANGE STATEMENT	
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.	
High-grade mechanical watch characteristics	High-grade mechanical watch characteristics may include: • finish of components (e.g. bevelling, graining or level of polish) • type of materials used for movement and case construction (e.g. non-magnetic alloys and precious metals) • quality of components used (e.g. balance spring, escapement and balance wheel) • certification chronometer • brand name • number of jewels

RANGE STATEMENT	
Record and document repair	Record and document repair may include: • date and extent of repair • cost of replacement part • time spent on procedure
Performance analysis	Performance analysis may include: • watch subjected to various testing positions (e.g. dial up, dial down, crown up, crown down, crown right and left) • states of winding (e.g. partly wound, half wound and fully wound) • temperature variation • factors affecting isochronism (e.g. equal time of vibration)
Oscillator and balance spring condition	Oscillator and balance spring condition may include: • static poise of balance wheel • balance spring condition (e.g. concentric, flatness and beating evenly between curb pins)
Dynamic poising	Dynamic poising may include: • set up and determine out-of-poise/balance wheel using a timing machine (e.g. amplitude <180 degrees) • identify and locate point of adjustment • methods of adjustment (e.g. cutters and milling tools)
Confirm all adjustments	Confirm all adjustments may include: • ensure required accuracy is obtained and timekeeping is in accordance with manufacturer specifications (e.g. chronometer certified rating +/- 4 to 5 seconds per day)
Watch performance and rate testing	Watch performance and rate testing may include: • in-beat • rate adjustment • amplitude • effect or influence of escapement • temperature • effect of positional errors (e.g. isochronism) • effect of balance wheel poise

RANGE STATEMENT	
	• effect of balance spring • states of winding
Longitudinal testing	Longitudinal testing may include: • testing over extended time period by wearing or simulator machine (e.g. cyclomat)
Hand tools and equipment	Hand tools and equipment may include: • mechanical watch timing machine • poising tools • balance wheel cutters • case opening and closing tools
Working environment	Working environment may include: • clean bench and working area • adequate lighting and ventilation • tools and equipment organised and in good condition • ergonomic seating
Clean and safe work environment	Clean and safe work environment may be specified through: • relevant legislation and regulations • enterprise operating procedures • 5S housekeeping related principles and procedures (e.g. sort, straighten, shine, standardise, sustain)

Unit Sector(s)

Unit sector	Horology
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Co-requisite units

Co-requisite units		

Co-requisite units		

Competency field

Competency field	
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