



**Australian Government**

# **AURMTQ4001 Analyse and repair complex performance driveline systems**

**Release 1**

## **AURMTQ4001 Analyse and repair complex performance driveline systems**

### **Modification History**

| <b>Release</b>   | <b>Comment</b>                                                                                                                                                                                   |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Release 1</b> | Replaces AURM441293B Analyse and repair complex performance driveline systems<br>Unit code updated to meet policy requirements<br>Reference to OHS legislation replaced with new WHS legislation |

## Unit Descriptor

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>Unit descriptor</b> | <p>This unit of competency describes the skills and knowledge required to analyse and repair complex performance transmissions, final drive and drivelines, including engine to transmission drive couplings.</p> <p>It requires the technical ability to test, identify repairs or performance enhancement strategies, and to conduct repairs, adjustments and post-repair checks to complex performance transmissions, final drive and drivelines.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p> |
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## Application of the Unit

|                                |                                                                                                                                                                                                                                                    |
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| <b>Application of the unit</b> | <p>This unit applies to individuals who analyse faults and repair and implement performance improvement strategies in complex performance transmissions, final drive and drivelines in the motorsport and performance enhancement environment.</p> |
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## Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

| <b>Prerequisite units</b> |                                                |
|---------------------------|------------------------------------------------|
| AURLTQ3001                | Repair final drive assemblies (light vehicle)  |
| AURLTQ3002                | Repair final drive - driveline (light vehicle) |
| AURLTX3001                | Repair transmissions - manual (light vehicle)  |
| AURMTA3007                | Conduct non-destructive testing                |

## Employability Skills Information

|                             |                                          |
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| <b>Employability skills</b> | This unit contains employability skills. |
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## Elements and Performance Criteria Pre-Content

|                                                                   |                                                                                                                                                                        |
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| Elements describe the essential outcomes of a unit of competency. | Performance criteria describe the performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide. |
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## Elements and Performance Criteria

| ELEMENT                                                                       | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Identify and confirm faults                                                | <p>1.1. Use controlling body rules, category rules, supplementary regulations and team requirements to specify task requirements, including configuration, equipment, quality and quantities</p> <p>1.2. Access and interpret benchmark specifications for a correctly functioning transmission/final drive/driveline</p> <p>1.3. Observe workplace health and safety (WHS) requirements, including regulatory requirements, equipment and system isolation requirements, and personal protection needs, throughout the work</p> <p>1.4. Examine the details of the fault and document available preliminary information</p> <p>1.5. Identify the effects of the fault and confirm from direct and/or indirect evidence</p> <p>1.6. Identify and respond to possible safety impacts of the fault in accordance with regulatory and team obligations and practices</p> |
| 2. Prepare for fault analysis                                                 | <p>2.1. Identify possible causes of the fault, including intermittent faults, from an analysis of technical support information and available onboard diagnostic systems</p> <p>2.2. Develop the most appropriate analysis process, including sequence, tests and testing equipment, and select from the range of available options</p> <p>2.3. Obtain test equipment and prepare for the application in accordance with regulatory, manufacturer and team requirements</p> <p>2.4. Select and prepare for use, tooling and materials required to support the diagnostic process</p> <p>2.5. Prepare complex performance driveline system components for the diagnostic process, including isolation and cleaning requirements</p>                                                                                                                                    |
| 3. Diagnose the fault and determine repair/performance enhancement strategies | <p>3.1. Undertake the selected analysis process in accordance with technical specifications and directions and/or the locally authorised method</p> <p>3.2. Apply test and use testing equipment in accordance with regulatory requirements and manufacturer/component supplier specifications</p> <p>3.3. Verify test results and other diagnostic findings, if necessary, by using reliable alternative or optional</p>                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| ELEMENT                                                          | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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|                                                                  | <p>processes</p> <p>3.4.Obtain authority to partly dismantle components, to permit an accurate inspection of analysed faults, if required</p> <p>3.5.Draw valid conclusions about the cause, and draw direct and indirect consequences of the fault from available evidence and document to team requirements</p> <p>3.6.Research technical support information and use to identify options for rectifying the fault or enhancing performance</p> <p>3.7.Select the most appropriate option from an analysis of the options, the prevailing circumstances, regulatory requirements and team policies</p> <p>3.8.Document and communicate the selected repairs/modifications or adaptation of equipment to appropriate persons, including the analysis outcome and repair requirements</p> |
| 4. Conduct repairs/ implement performance improvement strategies | <p>4.1.Carry out repairs and adjustments to components/sub-assemblies in accordance with manufacturer/component supplier specifications for methods, equipment used and tolerances relative to the system</p> <p>4.2.Conduct post-repair checks and vehicle start-up</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5. Clean up work area and finalise documentation                 | <p>5.1.Clean, maintain and prepare equipment and tooling for future use and store in accordance with manufacturer/component supplier specifications and team requirements</p> <p>5.2.Remove surplus and unserviceable components in accordance with team procedures</p> <p>5.3.Report problems with the work area or the operation of the equipment to appropriate persons</p> <p>5.4.Record work/vehicle documentation</p>                                                                                                                                                                                                                                                                                                                                                               |

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

#### Required skills

Required skills include:

- technical skills to the level required to use workplace technology related to the analysis and repair of complex performance driveline systems, including tooling, measuring devices, test instruments, workshop equipment, calculators and computers
- communication skills to the level required to communicate ideas and information to enable clarification of requirements, coordination of work with supervisors and other workers, and to report work outcomes and resolution of problems
- literacy skills to the level required to collect, organise and understand information related to the analysis and repair of complex performance driveline systems, including technical, regulatory, environmental and safety requirements
- numeracy skills to the level required to use mathematical ideas and techniques to correctly complete measurements and calculations required during the analysis and repair of complex performance driveline systems
- problem-solving skills to the level required to create and apply systematic diagnostic and problem-solving techniques to anticipate problems, avoid reworking and avoid wastage
- team skills to the level required to work with others to foster the team by recognising dependencies and using cooperative approaches to optimise communication, workflow and productivity
- planning skills to the level required to plan and organise activities, including the preparation and layout of the work area, and the coordination of equipment, systems and material to avoid backtracking, workflow interruptions or wastage

#### Required knowledge

Required knowledge includes:

- types, function, operations and limitations of complex performance transmission, final drive and drivelines, including engine-transmission drive couplings, such as clutches and torque converters
- diagnosis and testing procedures, and test instrument application
- symptom and cause differentiation
- repair and performance improvement strategies
- removal, replacement and repair, adjustment and post-repair check procedures
- diagnosis theory, including concept, design and planning
- record keeping procedures
- procedures for reporting equipment faults and component defects
- team guidelines regarding acceptable quality and tolerance levels

**REQUIRED SKILLS AND KNOWLEDGE**

- equipment safety requirements
- WHS policies and procedures
- applicable commonwealth, state or territory legislation, regulations, standards and codes of practice, including WHS, personal safety and environment, relevant to complex fuel systems

## 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

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

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

- interpret and apply team requirements, controlling body and category rules and supplementary regulations
- apply safety requirements, including the isolation of equipment and the use of personal protective equipment
- follow task instructions, operating procedures and inspection processes to:
  - minimise the risk of injury to self or others
  - prevent damage to competition vehicle or equipment
  - achieve required outcomes within team time and quality standards
- correctly analyse, repair and conduct post-repair checks on a minimum of four (4) driveline systems faults which could involve:
  - selection, noise, vibration, harshness or slipping faults
  - faults which give the same effects, but may have multiple causes
  - the scope of the faults necessitates the use of a range of testing equipment
- work effectively with others.

#### Context of, and specific resources for assessment

- The application of competency is to be assessed in the workplace or a simulated environment that reflects as far as possible the actual working environment.
- Assessment is to occur using standard and authorised work practices, safety requirements and environmental constraints.
- Assessment is to comply with relevant regulatory requirements, including specified Australian standards.
- Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
- The following resources should be made available:
  - access to competition vehicles driveline systems and

| <b>EVIDENCE GUIDE</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            | <p>associated test instruments</p> <ul style="list-style-type: none"> <li>• material and equipment</li> <li>• information on work specifications</li> <li>• team requirements</li> <li>• organisational procedures</li> <li>• safety procedures, regulations and quality standards.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Method of assessment</b>                | <ul style="list-style-type: none"> <li>• Assessment must satisfy the endorsed Assessment Guidelines of this 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 application of Required Skills and Knowledge.</li> <li>• Assessment methods must be by direct observation of tasks and include questioning on Required Skills and 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 able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</li> <li>• Competence in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role.</li> </ul> |
| <b>Guidance information for assessment</b> | <p>Assessment processes and techniques must be culturally sensitive and appropriate to the language and literacy capacity of the candidate and the work being performed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Range Statement

| <b>RANGE STATEMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <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>RANGE STATEMENT</b>                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Complex performance transmission</b> | A complex performance transmission is defined as one that is a specialised motorsport/performance component integrating two or more systems that use either mechanical, hydraulic, pneumatic or electrical/electronic media                                                                                                                                                                                                                                                                     |
| <b>Driveline systems</b>                | Driveline systems, including sub-systems and components, may include: <ul style="list-style-type: none"> <li>• clutches</li> <li>• torque converters</li> <li>• manual and automatic transmissions</li> <li>• drive shafts</li> <li>• final drives</li> </ul>                                                                                                                                                                                                                                   |
| <b>Diagnosis</b>                        | Diagnosis includes covering: <ul style="list-style-type: none"> <li>• module and parts replacement in related electrical, electronic, pneumatic or hydraulic control systems</li> </ul>                                                                                                                                                                                                                                                                                                         |
| <b>Driveline system faults</b>          | Driveline system faults may include: <ul style="list-style-type: none"> <li>• abnormal gear wear</li> <li>• abnormal clutch operations</li> <li>• contamination</li> <li>• hard shifting</li> <li>• harshness</li> <li>• loose mountings</li> <li>• leaks</li> <li>• lubrication</li> <li>• noises,</li> <li>• transmission slippage and vibrations</li> <li>• indirect faults caused by the influence of external systems which may or may not be faulty in their primary operation</li> </ul> |
| <b>WHS requirements</b>                 | WHS requirements are to be in accordance with applicable commonwealth, state or territory legislation and regulations, and organisational safety policies and procedures, and may include: <ul style="list-style-type: none"> <li>• personal protective equipment and clothing, including closed-in shoes, long trousers, handling gloves and other equipment</li> <li>• safety equipment</li> <li>• first aid equipment</li> </ul>                                                             |

| <b>RANGE STATEMENT</b>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | <ul style="list-style-type: none"> <li>• hazard and risk control</li> <li>• elimination of hazardous materials and substances</li> <li>• manual handling, including shifting, lifting and carrying</li> <li>• emergency procedures</li> <li>• team insurance requirements</li> <li>• material safety management systems</li> <li>• controlling body requirements</li> <li>• manufacturer/component supplier specifications\</li> <li>• local safe operating procedures</li> </ul>                                                                            |
| <b>Legislative requirements</b>   | <p>Legislative requirements are to be in accordance with applicable commonwealth, state or territory legislation, regulations, certification requirements and codes of practice, and may include:</p> <ul style="list-style-type: none"> <li>• award and enterprise agreements</li> <li>• industrial relations</li> <li>• Australian standards</li> <li>• confidentiality and privacy</li> <li>• WHS</li> <li>• the environment</li> <li>• equal opportunity</li> <li>• anti-discrimination</li> <li>• duty of care</li> <li>• health regulations</li> </ul> |
| <b>Tooling and equipment</b>      | <p>Tooling and equipment may include:</p> <ul style="list-style-type: none"> <li>• hand tooling</li> <li>• manufacturer/component supplier specialist tooling</li> <li>• jacking and lifting equipment</li> <li>• measuring devices and test instruments</li> <li>• computerised diagnostic systems</li> <li>• computers and related software</li> </ul>                                                                                                                                                                                                     |
| <b>Information and procedures</b> | <p>Information and procedures may include:</p> <ul style="list-style-type: none"> <li>• controlling body rules, category rules and supplementary regulations</li> <li>• event scheduling and location details</li> <li>• team procedures and standards related to:</li> </ul>                                                                                                                                                                                                                                                                                |

**RANGE STATEMENT**

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|  | <ul style="list-style-type: none"><li>• applying diagnosing and maintaining complex performance driveline systems</li><li>• life of components</li><li>• reporting and communication</li><li>• use of tooling and equipment</li><li>• emergency service contacts and team persons emergency contacts</li><li>• team emergency and event procedures for accidents or injury</li><li>• work instructions, including worksheets, material safety data sheets (MSDS), assembly procedures, plans, drawings, designs and checklists</li><li>• manufacturer/component supplier specifications and application procedures for test equipment and material</li><li>• safety body publications</li><li>• environmental, hazardous chemicals and dangerous goods legislation and local requirements relating to the disposal and use of fuels, lubricants, coolants and cleaning agents</li></ul> |
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**Unit Sector(s)**

|                    |            |
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| <b>Unit sector</b> | Motorsport |
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**Co-requisite units**

Not applicable.

**Competency field**

|                         |                                        |
|-------------------------|----------------------------------------|
| <b>Competency field</b> | Technical - Driveline and Final Drives |
|-------------------------|----------------------------------------|