

# **SEG Awards Level 3 Award in the Diagnosis and Rectification of Faults on Electric and Hybrid/Electric Light Vehicles**

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## **Qualification Guidance**

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**England  
Level 3 Award - 610/0869/2**

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## About Us

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At the Skills and Education SEG Awards we continually invest in high quality qualifications, assessments and services for our chosen sectors. As a UK leading sector specialist we continue to support employers and skills providers to enable individuals to achieve the skills and knowledge needed to raise professional standards across our sectors.

Skills and Education Group Awards has an on-line registration system to help customers register learners on its qualifications, units and exams. In addition it provides features to view exam results, invoices, mark sheets and other information about learners already registered.

The system is accessed via a web browser by connecting to our secure website using a username and password: <https://ors.skillsandeducationgroup.co.uk/>

## Sources of Additional Information

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The Skills and Education Group Awards website <https://skillsandeducationgroupawards.co.uk/> provides access to a wide variety of information.

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This document may be copied by approved centres for the purpose of assessing learners. It may also be copied by learners for their own use.

## Specification Code, Date and Issue Number

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The specification code is A6019-03.

<b>For Skills and Education Awards Use Only</b>		
<b>Version</b>	<b>Date</b>	<b>Details of change</b>
1	12/5/2022	Original document
1.1	17/04/2023	Update to formatting

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This is a live document and as such will be updated when required. It is the responsibility of the approved centre to ensure the most up-to-date version of the Qualification Guide is in use. Any amendments will be published on our website and centres are encouraged to check this site regularly.

## Introduction

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This two unit qualification is designed for people who work on electric and hybrid/electric vehicles. The unit includes essential knowledge of the hazards associated with electric and hybrid/electric vehicles, the precautions to follow to avoid these hazards and an understanding of the operating principles of these vehicles to carry out diagnostic and rectification methods and procedures for the repair of faults. It enables the learner to understand how to safely isolate and reinstate the high voltage system and to remove and replace high voltage components also the correct methods and process for using diagnostic and test equipment

## Pre-requisites

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It is a recommendation that candidates have completed a level 2 Electric and Hybrid/Electric light vehicle qualification before completing this qualification. However it is not mandatory but a good level of experience and subject knowledge of the operating principles and operation of an Electric and Hybrid/electric light vehicle and its relevant systems would be a great advantage and would reduce the need to complete all the units contained within this qualification

## Qualification Structure

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This qualification is also mapped to the following National Occupational Standard –

Unit	Unit Number	Level	Credit Value	GLH
Mandatory – Group A				
Knowledge and understanding of the diagnosis and rectification of faults on electric and hybrid/electric light vehicles	M/650/2489	3	2	26
Prepare an electric or hybrid/electric light vehicle to carry out diagnostic and rectification procedures	Y/650/2490	3	1	2

## Assessment

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In order to successfully achieve this qualification a learner must fully meet all of the learning outcomes. This is done by completing the Skills and Education Group Awards' online multiple choice test.

The practical assessment has been developed to meet all of the requirements for this qualification. For this purpose centre devised alternatives are not permitted.

The multiple choice online test is separated into four areas and contains a total of 20 questions. The maximum time allowed to complete the assessment is **60 minutes** and the questions will assess the knowledge from across the breadth of the criteria in the following way:

Subject	Number of questions
<ul style="list-style-type: none"><li>Understand the risks and hazards associated with electric and hybrid/electric light vehicles</li></ul>	6
<ul style="list-style-type: none"><li>Know and understand the different types of electric and hybrid/electric light vehicles, their operation and the associated technology in order to diagnose and rectify vehicle faults</li></ul>	8
<ul style="list-style-type: none"><li>Know and understand the function of components how to identify them and the correct testing and replacement procedures</li></ul>	8
<ul style="list-style-type: none"><li>Know how to work safely when carrying out diagnostic and rectification procedures on electric and hybrid/electric light vehicles</li></ul>	8

The grade boundaries for the online multiple choice knowledge test are as follows:

- 0 - 59% = **Fail**
- 60 -100% = **Pass**

### Online Test and Retakes

The online test must be conducted under exam conditions and in line with the SEG Awards document "Instructions for the Conduct of Examinations and Other External Assessment" which is available here:

<https://skillsandeducationgroupawards.co.uk/for-centres/>

There is no limit on the amount of retakes, however there will be a charge for each one taken.

## Teaching Strategies and Learning Activities

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Centres should adopt a delivery approach which supports the development of all individuals. The aims and aspirations of all the learners, including those with identified special needs or learning difficulties/disabilities, should be considered and appropriate support mechanisms put in place.

## **Progression Opportunities**

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Learners who successfully complete the Level 3 Award may be able to continue in further education and training related to this area of expertise or progress into employment.

Centres should be aware that Reasonable Adjustments which may be permitted for assessment may in some instances limit a learner's progression into the sector. Centres must therefore inform learners of any limits their learning difficulty may impose on future progression, if applicable.

## **Tutor Requirements**

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Skills and Education Group Awards require those involved in the delivery process to be suitably experienced and/or qualified. In general terms, this usually means that the tutor must be knowledgeable of the subject/occupational area to at least the level they are delivering at.

Those responsible for Internal Quality Assurance (IQA) must be knowledgeable of the subject/occupational area to a suitable level to carry out accurate quality assurance practices and processes.

## **Language**

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This specification and associated assessment materials are in English only.

## Qualification Summary

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<b>Qualification</b>	
Level 3 Award to Diagnose and Rectify Faults on Electric and Hybrid/Electric Light Vehicles	
<b>Qualification Purpose</b>	Prepare for further learning or training and/or develop knowledge and/or skills in a subject area
<b>Regulation</b>	The above qualification is regulated by: <ul style="list-style-type: none"> <li>• Ofqual</li> </ul>
<b>Assessment</b>	<ul style="list-style-type: none"> <li>• External assessment</li> <li>• Internal and external moderation</li> </ul>
<b>Grading</b>	Pass only
<b>Operational Start Date</b>	12/5/2022
<b>Review Date</b>	31/8/2025
<b>Operational End Date</b>	
<b>Certification End Date</b>	
<b>Guided Learning</b>	28
<b>Total Qualification Time (TQT)</b>	30
<b>Credit Value</b>	3
<b>Sector</b>	Automotive
<b>Ofqual SSA Sector</b>	4.3 Transportation Operation and Maintenance
<b>Support from Trade Associations</b>	
<b>Administering Office</b>	See the Skills and Education Group Awards website <a href="https://skillsandeducationgroupawards.co.uk/">https://skillsandeducationgroupawards.co.uk/</a>

## Unit Details

### 1. Knowledge and Understanding of the Diagnosis and Rectification of Faults on Electrical and Hybrid/Electric Light Vehicles

<b>Unit Reference</b>	M/650/2489
<b>Level</b>	3
<b>Credit Value</b>	2
<b>Guided Learning</b>	26
<b>Unit Summary</b>	This unit is for people who carry out repairs to electric or hybrid/electric light vehicles. The unit includes essential knowledge and understanding for technicians to carry out the correct methods and practices safely and competently when carrying out diagnostic and rectification procedures on electric and hybrid/electric vehicles. It enables the learner to understand how to safely isolate and reinstate the high voltage system and to remove and replace high voltage components.
<b>Learning Outcomes (1 to 4)</b> <i>The learner will</i>	<b>Assessment Criteria (1.1 to 4.1)</b> <i>The learner can</i>
1. Understand the risks and hazards associated with electric and hybrid/electric light vehicles	<p>1.1 Describe the health and safety legislation and workplace procedures relating to working on, near or with electric and hybrid/electric light vehicles. To include:</p> <ul style="list-style-type: none"> <li>• Electrical equipment (safety) regulations</li> <li>• The electricity at work regulations</li> <li>• Requirements for electrical installations BS 7671:2001</li> </ul> <p>1.2 Describe the dangers relating to:</p> <ul style="list-style-type: none"> <li>• Working with high voltages</li> <li>• Electrocutation</li> <li>• Battery electrolyte gel</li> <li>• Hazards associated with alternative fuel sources and systems, including hydrogen fuel cells</li> </ul> <p>1.3 Describe safety requirements including:</p> <ul style="list-style-type: none"> <li>• First Aid</li> <li>• Tools and equipment</li> <li>• Ventilation</li> <li>• High voltage isolation</li> <li>• Dealing with electrolyte gel spillages</li> </ul>



	<ul style="list-style-type: none"> <li>• Environmental Protection Action to include sections 33 and 34</li> <li>• Control of Substances Hazardous to Health (COSHH)</li> <li>• Independent working bay</li> <li>• Risk assessment</li> <li>• Workplace signage</li> </ul> <p>1.4 Describe vehicle power systems and their associated safety risks, to include:</p> <ul style="list-style-type: none"> <li>• Internal combustion engines</li> <li>• Electric only vehicles</li> <li>• Plug-in hybrid vehicles</li> <li>• Hybrid vehicle systems</li> </ul>
<p>2. Know and understand the different types of electric and hybrid/electric light vehicles, also the associated technology to diagnose and rectify vehicle faults</p>	<p>2.1 Know and understand electrical/electronic principles to include:</p> <ul style="list-style-type: none"> <li>• Ohms law</li> <li>• Voltage</li> <li>• Power</li> <li>• Current</li> <li>• Resistance</li> <li>• Electromagnetism</li> <li>• Induction</li> <li>• Symbols ,units, terms</li> <li>• Vehicle wiring systems and diagrams</li> <li>• Multiplexing and earth systems</li> <li>• Digital and fibre optic systems</li> <li>• High and low voltage circuit protection</li> </ul> <p>2.2 Know and understand the operation of components contained within electric and hybrid/electric light vehicle systems and the correct methods to diagnose and rectify faults to include:</p> <ul style="list-style-type: none"> <li>• High voltage batteries</li> <li>• Service plug</li> <li>• Invertor</li> <li>• Transaxle damper</li> <li>• Motor generators</li> <li>• High voltage cables</li> <li>• Convertor</li> <li>• Cooling components</li> </ul> <p>2.3 Understand the operating principles of components associated with the operation of electric and hybrid/electric light vehicles to carry out correct diagnostic and repair methods to include:</p> <ul style="list-style-type: none"> <li>• Voltages- High and low</li> <li>• Batteries – High voltage and auxiliary</li> <li>• Controls and keys</li> </ul>

	<ul style="list-style-type: none"> <li>• Vehicle de-energising periods required for safe repair</li> <li>• Chassis and insulated earth return systems</li> <li>• High voltage circuit protection</li> <li>• Regenerative braking</li> <li>• Temperature – Operating temperature of electric and hybrid/electric light vehicle batteries</li> </ul> <p>2.4 Know and understand the construction and function of high voltage batteries how to identify them where to get the correct information for testing procedures to include battery types:</p> <ul style="list-style-type: none"> <li>• Nickel Metal Hydride (Ni-Mh)</li> <li>• Lithium (Li-ion)</li> </ul> <p>2.5 Understand the construction and function of high voltage components to carry out manufacturers recommendations for diagnosing and rectifying faults to include:</p> <ul style="list-style-type: none"> <li>• High voltage batteries</li> <li>• Service plug</li> <li>• Charging coupler</li> <li>• Inverter</li> <li>• Power/battery management system</li> <li>• Electric motors</li> <li>• Transaxle damper</li> <li>• Motor generators</li> <li>• High voltage cables</li> <li>• Converter</li> <li>• Cooling components</li> </ul> <p>2.6 Know how to store parts and components in line with manufacturer’s recommendations to include:</p> <ul style="list-style-type: none"> <li>• Batteries</li> <li>• Secure storage</li> <li>• Clear labelling</li> <li>• Procedure relating to damaged/broken parts</li> <li>• Correct disposal or recycling</li> </ul>
<p>3. Know and understand the function of components how to identify them and the correct testing and replacement procedures</p>	<p>3.1 Describe the preparation of the vehicle, prior to conducting diagnostic, testing methods and practices to include:</p> <ul style="list-style-type: none"> <li>• Select, check and use appropriate personal and vehicle protective equipment</li> <li>• Find, interpret and use sources of information applicable to component removal and replacement within an electric and hybrid/electric vehicle high energy system</li> <li>• Carry out a risk assessment on damaged and broken down electric and hybrid/electric light vehicles</li> </ul>

	<ul style="list-style-type: none"> <li>• Making others aware of work being carried out on electric and hybrid/electric vehicles</li> <li>• Work in a way that minimises the risk of damage to your working environment and injury to yourself and others</li> <li>• Identifying high energy systems</li> <li>• How to identify high voltage components and cabling, their route and location</li> <li>• Prepare, check and calibrate test equipment prior to use</li> <li>• Work in a way that minimises the risk of damage to other vehicle systems, components and units</li> <li>• Select replacement components which meet manufacturer’s recommendations or conform to operational specification</li> <li>• Procedure to power down, isolate and make safe the high energy electrical system</li> <li>• Vehicle de-energising periods required for safe repair</li> </ul>
<p>4. Know how to work safely on an electric and hybrid/electric light vehicle</p>	<p>4.1 Describe safe working methods for:</p> <ul style="list-style-type: none"> <li>• Selecting and using appropriate PPE and equipment</li> <li>• The implications of electrical conductivity through the human body</li> <li>• Selecting suitable sources of technical information</li> <li>• Carrying out safe isolation of the vehicle high energy system</li> <li>• Confirm an electric and hybrid/electric light vehicle is safe to work on</li> <li>• Reduce the risk of high voltage hazard when working on and around electric and electric/hybrid light vehicles</li> <li>• Hazards associated with electric and electric/hybrid light vehicle repairs and maintenance</li> <li>• Correctly and safely re-instating the vehicle according to the manufacturer’s instructions</li> <li>• Safely and correctly removing and replacing high energy components following manufacturer’s instructions, industry recognised repair methods and health and safety requirements</li> <li>• Follow manufacturer’s instruction to evaluate the performance of the reassembled high voltage system</li> <li>• Recovery of disabled electric and hybrid/electric vehicles</li> <li>• Understand the methods and practices associated with charging electric and hybrid electric vehicles</li> </ul>

	<ul style="list-style-type: none"><li>• Store, dispose of, recycle and return removed high voltage components in line with legislative and organisation requirements</li><li>• Ensure records are accurate, complete and passed to the relevant person(s) promptly in the format required</li></ul>
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## 2. Prepare an Electric or Hybrid/Electric Light Vehicle to Carry Out Diagnostic and Repair Procedures

<b>Unit Reference</b>	Y/650/2490
<b>Level</b>	3
<b>Credit Value</b>	1
<b>Guided Learning</b>	3
<b>Unit Summary</b>	<p>This unit is for people who carry out repairs to electric or hybrid/electric light vehicles. The unit includes essential knowledge and understanding for technicians to carry out the correct methods and practices safely and competently when carrying out diagnostic and rectification procedures on electric and hybrid/electric vehicles. It enables the learner to understand how to safely isolate and reinstate the high voltage system and to remove and replace high voltage components. You must be observed by your assessor completing all of the following tasks on at least one occasion</p>
<b>Learning Outcomes (1 to 1)</b> <i>The learner will</i>	<b>Assessment Criteria (1.1 to 1.7)</b> <i>The learner can</i>
1. Diagnose and repair an electric or hybrid/electric light vehicle	<p>1.1. Use suitable signage when working on electric or electric/hybrid vehicles</p> <p>1.2 Use correct personal and vehicle protective equipment at all times</p> <p>1.3 Select and refer to suitable technical information applicable to the task and vehicle</p> <p>1.4 Carry out the safe isolation of the vehicle high voltage system according to the manufacturers recommendations</p> <p>1.5 Diagnose and rectify faults on an electric or hybrid/electric light vehicle</p> <p>1.6 Use the correct procedure to connect an alternative power source to an electric or electric/hybrid vehicle according to the manufacturer's instructions</p> <p>1.7 Use the correct procedure to re-instate the vehicle high voltage system according to the manufacturers recommendations</p>

# Recognition of Prior Learning (RPL), Exemptions, Credit Transfers and Equivalencies

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Skills and Education Group Awards policy enables learners to avoid duplication of learning and assessment in a number of ways:

- Recognition of Prior Learning (RPL) – a method of assessment that considers whether a learner can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess and do not need to develop through a course of learning.
- Exemption - Exemption applies to any certificated achievement which is deemed to be of equivalent value to a unit within Skills and Education Group Awards qualification but which does not necessarily share the exact learning outcomes and assessment criteria. It is the assessor's responsibility, in conjunction with the Internal Moderator, to map this previous achievement against the assessment requirements of the Skills and Education Group Awards qualification to be achieved in order to determine its equivalence.
- Any queries about the relevance of any certificated evidence, should be referred in the first instance to your centre's internal moderator and then to Skills and Education Group Awards.

It is important to note that there may be restrictions upon a learner's ability to claim exemption or credit transfer which will be dependent upon the currency of the unit/qualification and a learner's existing levels of skill or knowledge.

Where past certification only provides evidence that could be considered for exemption of part of a unit, learners must be able to offer additional evidence of previous or recent learning to supplement their evidence of achievement.

- Credit Transfer – Skills and Education Group Awards may attach credit to a qualification, a unit or a component. Credit transfer is the process of using certificated credits achieved in one qualification and transferring that achievement as a valid contribution to the award of another qualification. Units/Components transferred must share the same learning outcomes and assessment criteria along with the same unit number. Assessors must ensure that they review and verify the evidence through sight of:
  - Original certificates OR
  - Copies of certificates that have been signed and dated by the internal moderator confirming the photocopy is a real copy and make these available for scrutiny by the External Moderator.
- Equivalencies – opportunities to count credits from the unit(s) from other qualifications or from unit(s) submitted by other recognised organisations towards the place of mandatory or optional unit(s) specified in the rule of combination. The unit must have the same credit value or greater than the unit(s) in question and be at the same level or higher.

Skills and Education Group Awards encourages its centres to recognise the previous achievements of learners through Recognition of Prior Learning (RPL), Exemption, Credit Transfer and Equivalencies. Prior achievements may have resulted from past or present employment, previous study or voluntary activities. Centres should provide advice and guidance to the learner on what is appropriate evidence and present that evidence to the external moderator in the usual way.

Further guidance can be found in 'Delivering and Assessing Skills and Education Group Awards Qualifications' which can be downloaded from

<https://skillsandeducationgroupawards.co.uk/policies-and-procedures/>

## **Certification**

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Learners will be certificated for all units and qualifications that are achieved and claimed.

Skills and Education Group Awards' policies and procedures are available on the web site: <https://skillsandeducationgroupawards.co.uk/policies-and-procedures/>

## **Exemptions**

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There are no identified exemptions for this qualifications.

# Glossary of Terms

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## **GL (Guided Learning)**

Guided learning hours are where the learner participates in education or training under the immediate guidance or supervision of a tutor (or other appropriate provider of education or training). It may be helpful to think – ‘Would I need to plan for a member of staff to be present to give guidance or supervision?’

GL is calculated at qualification level and not unit/component level.

Examples of Guided Learning include:

- Face-to-face meeting with a tutor
- Telephone conversation with a tutor
- Instant messaging with a tutor
- Taking part in a live webinar
- Classroom-based instruction
- Supervised work
- Taking part in a supervised or invigilated formative assessment
- The learner is being observed as part of a formative assessment.

## **TQT (Total Qualification Time)**

The number of notional hours which represents an estimate of the total amount of time that could reasonably be expected to be required, in order for a learner to achieve and demonstrate the achievement of the level of attainment necessary for the award of a qualification. The size of a qualification is determined by the TQT.

TQT is made up of the Guided Learning Hours (GLH) plus all other time taken in preparation, study or any other form of participation in education or training but not under the direct supervision of a lecturer, supervisor or tutor.

TQT is calculated at qualification level and not unit/component level.

Examples of unsupervised activities that could contribute to TQT include:

- Researching a topic and writing a report
- Watching an instructional online video at home/e-learning
- Watching a recorded webinar
- Compiling a portfolio in preparation for assessment
- Completing an unsupervised practical activity or work
- Rehearsing a presentation away from the classroom
- Practising skills unsupervised
- Requesting guidance via email – will not guarantee an immediate response.