QUALIFICATION HANDBOOK

Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance & Level 3 Award in Hybrid Electric Vehicle Repair and Replacement (4290-70/71)

June 2020 Version 1.1

City & Guilds

Qualification at a glance

Subject area	Hybrid Electric Vehicles
City & Guilds number	4290
Age group approved	16+
Assessment	Assignment
Fast track	Not available. Full approval applies.
Support materials	Centre handbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance	4290-70	600/5221/1
Level 3 Award in Hybrid Electric Vehicle Repair and Replacement	4290-71	600/5220/X

Title and level	GLH	TQT	City & Guilds number	Accreditation number
Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance	20	20	4290-70	600/5221/1
Level 3 Award in Hybrid Electric Vehicle Repair and Replacement	50	50	4290-71	600/5220/X

Version and date	Change detail	Section
1.1 June 2020	TQT added	Qualifications at a glance

Contents

1	**Introduction**	**4**
	Structure	5
2	**Centre requirements**	**6**
	Approval	6
	Resource requirements	6
	Candidate entry requirements	7
3	**Delivering the qualification**	**8**
	Initial assessment and induction	8
	Support materials	8
4	**Assessment**	**9**
5	**Units**	**10**
Unit 722	**Automotive Internal Combustion and Electric Hybrid Technology Components and Operation**	**11**
Unit 723	**Automotive Internal Combustion and Electric Hybrid System Repair and Replacement**	**15**
Appendix 1	**Sources of general information**	**20**

1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who are the qualifications for?	These qualifications are for candidates who need to know more the safety precautions to be taken when working on or near a high voltage hybrid. Therefore, this applies not just to automotive technicians but also, for example, emergency services staff.
What do the qualifications cover?	As a result of learning, level 2 candidates will have learnt the essential knowledge about: • hybrid system components and operation • how to work safely on hybrid and related vehicle systems • how to work safely around electric vehicles. Level 3 candidates will have the essential knowledge for: • taking safety precautions when working on hybrid vehicle systems • using appropriate tools and equipment to carry out hybrid vehicles repairs safely • recording information and making suitable recommendations.
What opportunities for progression are there?	They allow candidates to progress into employment or to the following City & Guilds qualifications: • Level 3Award in Hybrid Electric Vehicle Repair and Replacement • ILM Leadership qualifications

Structure

To achieve the Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance, learners must achieve 2 credits from unit 722.

To achieve Level 3 Award in Hybrid Electric Vehicle Repair and Replacement, learners must achieve 5 credits from units 722 and 723.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
L/600/3397	722	Automotive Internal Combustion and Electric Hybrid Technology Components and Operation	2
Y/600/3399	723	Automotive Internal Combustion and Electric Hybrid System Repair and Replacement	3

2 Centre requirements

Approval

There is no fast track approval for this qualification, existing centres who wish to offer this qualification must use the **standard** Qualification Approval Process.

To offer these qualifications, new centres will need to gain both centre and qualification approval. Please refer to the *Centre Manual - Supporting Customer Excellence* for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification[s] before designing a course programme.

Resource requirements

Centres must have access to sufficient equipment in the college, training centre or workplace to ensure candidates have the opportunity to cover all of the practical activities.

Centre staffing

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area(s) for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.
- be able to show CPD evidence that they have undertaken hybrid training

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Assessor and verifiers

While the Assessor/Verifier (A/V) units are valued as qualifications for centre staff, they are not currently a requirement for this qualification.

Continuing professional development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.

Candidate entry requirements

City & Guilds does not set entry requirements for these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualifications successfully.

Age restrictions

City & Guilds cannot accept any registrations for candidates under 16 as these qualifications are not approved for under 16s.

3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs,
- support and guidance they may need when working towards their qualification.
- any units they have already completed, or credit they have accumulated which is relevant to the qualification.
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Support materials

The following resources are available for these qualifications:

Description	How to access
Assessment Pack	www.cityandguilds.com
Answer Pack	www.cityandguilds.com

4 Assessment

Candidates must:

- successfully complete one assignment for each mandatory unit

City & Guilds has written the following assessments to use with this qualification:

- assignments which are available from the City & Guilds website

Unit	Title	Assessment method
722	Automotive Internal Combustion and Electric Hybrid Technology Components and Operation	Assignment
723	Automotive Internal Combustion and Electric Hybrid System Repair and Replacement	Assignment.

Time constraints

The following must be applied to the assessment of this qualification:

- Candidates must finish their assessment within their registration period

5 Units

Availability of units

If you want to download a complete set of units, go to **www.cityandguilds.com**

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- guided learning hours
- unit aim
- endorsement by a sector or other appropriate body
- learning outcomes which are comprised of a number of assessment criteria

Summary of units

Unit	Title	UAN	Credits
722	Automotive Internal Combustion and Electric Hybrid Technology Components and Operation	L/600/3397	2
723	Automotive Internal Combustion and Electric Hybrid System Repair and Replacement	Y/600/3399	3

Unit 722 Automotive Internal Combustion and Electric Hybrid Technology Components and Operation

UAN:	**L/600/3397**
Level:	2
Credit value:	2
GLH:	20
Endorsement by a sector or regulatory body:	This unit is endorsed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit introduces learners to hybrid vehicle technology including, and in particular, the safety requirements of working on vehicles fitted with high voltage hybrid technology.

Learning outcome
The learner will: 1. Know hybrid system components and operation
Assessment criteria
The learner can: 1.1 Identify the **components** that make up the hybrid system 1.2 Describe the **construction and function of battery modules** 1.3 Describe the **construction and function of hybrid motors** 1.4 Describe the **construction and function of associated hybrid components**

Range
components • batteries • motor • cabling • control units • circuit protection

construction and function of battery modules

- types
- capacities
- housings
- materials
- connections
- charging process

construction and function of hybrid motors

- types
- connections
- power rating
- materials
- armatures
- windings

construction and function of associated hybrid components

- cabling
- circuit protection
- control units
- distribution units

Learning outcome
The learner will: 2. Know how to work safely on hybrid and related vehicle systems
Assessment criteria
The learner can: 2.1 State **safety precautions** to be taken before carrying out routine maintenance 2.2 State **safety precautions** to be taken before carrying out any repair procedures on hybrid vehicles 2.3 Identify **high voltage cabling and associated components** 2.4 Describe the **precautions** required when working with hybrid components

Range
Safety precautions • overalls • gloves • protective footwear • goggles • precautions when using electrical equipment • disposal of waste materials • dealing with leakage • isolation of high voltage electrical system

high voltage cabling and associated components

- using wiring diagrams
- wiring colour
- wiring size
- warning signs
- using voltmeters correctly

precautions

- awareness of highly magnetic components
- medical conditions that may be affected by high voltage or magnetic fields
- checking voltage prior to working near or on high voltage systems

Learning outcome
The learner will: 3. Know how to carry out maintenance and repair activities when working on hybrid vehicles
Assessment criteria
The learner can: 3.1 Identify the **possibility of the hybrid system affecting repairs on other vehicle systems** 3.2 Describe the **procedures** required to make safe the hybrid system before carrying out repair activities 3.3 Describe the **precautions** taken prior to removing and replacing high voltage components 3.4 Describe appropriate **methods** to re-instate vehicles after repairs affecting hybrid systems 3.5 Identify **additional tools and equipment** required to carry out work on hybrid vehicles 3.6 Describe **how to connect an additional 12 volt power source** to a hybrid vehicle

Range
possibility of the hybrid system affecting repairs on the other vehicle systems • connections to other systems • electro-magnetic interference **procedures** • identification of isolation switches • preparing vehicle for isolation • following set procedures **precautions** • check the system is made safe • check voltage prior to staring work • make others aware of work being carried out. **methods** • use of fault code readers

- on board displays

Additional tools and equipment

- hand tools
- code readers
- specialist readers
- electrical meters e.g. voltmeters

How to connect additional 12 volt power source

- identification of connections
- correct connection methods
- awareness of current draw capability of vehicle
- use of correct cables

Unit 723 Automotive Internal Combustion and Electric Hybrid System Repair and Replacement

UAN:	**Y/600/3399**
Level:	3
Credit value:	3
GLH:	30
Endorsement by a sector or regulatory body:	This unit is endorsed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables learners to demonstrate, in a practical way, their knowledge of hybrid vehicle technology and repair procedures. The unit also ensures that the learner is aware of the affect that hybrid technology has on other vehicle systems.

Learning outcome
The learner will: 1. Be able to work safely
Assessment criteria
The learner can: 1.1 Use suitable **personal protective equipment** throughout all vehicle inspection activities. 1.2 Demonstrate that they work in a way which **minimises the risk of damage** to the vehicle and its systems, other people and their property

Range
Personal protective equipment • overalls • gloves • protective footwear • goggles **Methods to minimise the risk of damage** • vehicle protection • precautions when using electrical equipment • disposal of waste material • awareness of actions of others

Learning outcome
The learner will: 2. Be able to use information to carry out the task
Assessment criteria
The learner can: 2.1 Select suitable **sources of technical information** to support hybrid vehicle repair activities. 2.2 Use suitable sources of technical information to support hybrid vehicle repair activities

Range
sources of technical information • manufacturer data • third party data • paper based • electronic • on vehicle data/warnings • wiring diagrams • repair instructions • bulletins • verbal instruction

Learning outcome
The learner will: 3. Be able to use appropriate tools and equipment
Assessment criteria
The learner can: 3.1 Select appropriate **tools and equipment** to carry out hybrid vehicle repairs 3.2 Demonstrate that **equipment** has been **calibrated** to meet manufacturers' requirements. 3.3 **Use** the correct **tools and equipment** in the correct way

Range
tools and equipment • hand tools • code readers • specialist tools • electrical meters e.g. voltmeter **Equipment that may be calibrated** • multimeters • torque wrenches • measuring equipment • manufacturers specialist tools

correct use of tools and equipment

- following manufacturer instructions
- following workplace procedures
- appropriate use of hand tools
- appropriate use of electrical tools
- appropriate use of specialist tools

Learning outcome
The learner will: 4. Know how to carry out hybrid system repairs
Assessment criteria
The learner can: 4.1 Explain the correct procedures required when removing and replacing hybrid system vehicle components 4.2 Explain how to disconnect high voltage supplies correctly e.g batteries, capacitors

Range
procedures • observation of H & S • correct use of PPE • correct use if tools and equipment • following repair procedures • following work place procedures **disconnecting high voltage supplies** • batteries • motors • cabling • control units • relays • switches • charging system • circuit protection • associated connectors

Learning outcome
The learner will: 5. Be able to demonstrate hybrid system repairs
Assessment criteria
The learner can: 5.1 Demonstrate the correct procedures to disconnect and reconnect a high voltage battery pack 5.2 Demonstrate the correct procedures to remove and refit a hybrid system **component**

5.1 Demonstrate appropriate **procedures to confirm repairs** successfully carried out
5.4 Demonstrate the correct **methods to reset vehicle systems** post-repair eg clear fault codes

Range

Components

- control units
- motor associated with hybrid operation
- associated cabling
- battery pack

procedures to confirm repairs

- on vehicle testing
- checking fault codes
- voltage checks
- use of specialist equipment

methods to reset vehicle systems

- use of scan tools
- on board diagnostics
- use of specialist equipment

Learning outcome

The learner will:

6. Be able to record information and make suitable recommendations

Assessment criteria

The learner can:

6.1 Complete **records** accurately, in the format required.
6.2 Compare inspection and test results with suitable **data**
6.3 Make suitable **recommendations** based upon the results of carrying out the replacement activities

Range

Records

- job cards
- warranty records
- online data transfer

data

- wiring diagrams
- repair instructions
- bulletins
- torque settings
- technical data

recommendations

- recommendations for further repairs
- recommendations for further replacement
- no further action required

- recommendations for customer

Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Qualifications and Credit Framework (QCF)**: general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- **Events**: dates and information on the latest Centre events
- **Online assessment**: how to register for e-assessments.

Useful contacts

UK learners **General qualification information**	**T: +44 (0)844 543 0033** **E: learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **centresupport@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: **singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

Every effort has been made to ensure that the information contained in this publication is true and correct at time of publication. However, City & Guilds products and services are subject to continuous development and improvement, and the right is reserved to change products and services from time to time. City & Guilds cannot accept responsibility for any loss or damage arising from the use of information in this publication.

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: feedbackandcomplaints@cityandguilds.com

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

Copyright

The content of this document is, unless otherwise indicated, © City & Guilds Limited and may not be copied, reproduced or distributed without prior written consent. However, approved City & Guilds centres and candidates studying for City & Guilds qualifications may photocopy this document free of charge and/or include a PDF version of it on centre intranets on the following conditions:

- **centre staff may copy the material only for the purpose of teaching candidates working towards a City & Guilds qualification, or for internal administration purposes**
- **candidates may copy the material only for their own use when working towards a City & Guilds qualification**

The *Standard Copying Conditions* (see the City & Guilds website) also apply.

Please note: National Occupational Standards are not © City & Guilds Limited. Please check the conditions upon which they may be copied with the relevant Sector Skills Council.

Published by City & Guilds Limited, a company registered in England and Wales (company number 16513878).

City & Guilds
1 Giltspur Street
London EC1A 9DD
T +44 (0)844 543 0000
F +44 (0)20 7294 2413
www.cityandguilds.com

HB-01-4290