City & Guilds
Level 3 Award in Diagnosis, Repair and Recalibration of Advanced Driver Assist Systems (7290-83)

June 2022 Version 1.1

Qualification Handbook

Qualification at a glance

Subject area	Automotive
City & Guilds number	7290-83
Age group approved	16+
Entry requirements	None
Assessment	Online multiple-choice test Practical assessment
Approvals	Full approval required
Support materials	Sample test materials SmartScreen
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Qualification number
City & Guilds Level 3 Award in Diagnosis, Repair and Recalibration of Advanced Driver Assist Systems	7290-83	610/0085/4

Version	Date	Change detail	Section
V1.0	March 2022	Document created	All
V1.1	June 2022	Quality Assurance – new section added	2 – Centre Requirements
		Access arrangements and special considerations – new section added	
		Time constraints – further information added on time constraints related to MCQ test and practical assessment	4 – Assessment
		Grading – new section added	5 – Grading

	Sources of general information – updated information/links to current regulatory references	Appendix 1
	Useful contacts and back page – revised information	Useful contacts and back page

Contents

1 Introduction

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

Area	Description
Who is the qualification for?	This qualification is designed for people who are looking to develop their knowledge and skills to allow them to safely test, diagnose, repair and recalibrate Advanced Driver Assist Systems.
What do the qualifications cover?	This qualification covers the competence and knowledge required to identify and rectify faults occurring in Advanced Driver Assistance Systems (ADAS) by carrying out diagnostic activities and then removing, replacing, and recalibrating sensors. ADAS includes systems for driver safety, pedestrian safety, motion/stability control and collision avoidance systems.
What opportunities for progression are there?	This qualification allows candidates to progress on to employment and/or career progression in the repair, diagnosis, and rectification of ADAS systems. Examples include Specialist Technician or Master Technician. The Qualification also has links to the Vehicle Damage (MET) role.
Who did we develop the qualification with?	This qualification has been developed using the National Occupational Standards as set by automotive industry experts.

Structure

City & Guilds Level 3 Award in Diagnosis, Repair and Recalibration of Advanced Driver Assist Systems		
City & Guilds unit number	**Unit title**	**GLH**
830	Knowledge of Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components	20
831	Skills in Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components	7

Total Qualification Time

Total Qualification Time (TQT) is the number of notional hours which represents an estimate of the total amount of time that could reasonably be expected for a learner to achieve and demonstrate the achievement of the level of attainment necessary for the award of a qualification.

TQT is comprised of the following two elements:

1. The number of hours which an awarding organisation has assigned to a qualification for Guided Learning.
2. An estimate of the number of hours a Learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by - but, unlike Guided Learning, not under the Immediate Guidance or Supervision of - a lecturer, supervisor, tutor or other, appropriate provider of education or training.

Title and level	GLH	TQT
City & Guilds Level 3 Award in Diagnosis, Repair and Recalibration of Advanced Driver Assist Systems	27	32

2 Centre requirements

Approval

To offer this qualification, centres will need to gain both centre and qualification approval. Please refer to ***City & Guilds Centre Approval Process Quality Assurance Standards*** *document* for further information, see **Centre Document Library**.

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

Resource requirements

Equipment

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. Further information on the equipment required can be found in the Assessment Pack.

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.

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

Quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Quality assurance includes initial centre approval, qualification approval and the centre's own internal procedures for monitoring quality.

Centres are responsible for internal quality assurance and City & Guilds is responsible for external quality assurance. For more detail on this visit the **Quality Assurance Standards** documents on the City & Guilds website.

Standards and rigorous quality assurance are maintained by the use of:

- Internal quality assurance
- City & Guilds external quality assurance.

In order to carry out the quality assurance role, Internal Quality Assurers must

- have appropriate teaching and vocational knowledge and expertise
- have experience in quality management/internal quality assurance
- hold or be working towards an appropriate teaching/training/assessing qualification
- be familiar with the occupation and technical content covered within the qualification.

External quality assurance for the qualification will be provided by City & Guilds EQA process. EQAs are appointed by City & Guilds to approve centres, and to monitor the assessment and internal quality assurance carried out by centres. External quality assurance is carried out to ensure that assessment is valid and reliable, and that there is good assessment practice in centres.

The role of the EQA is to:

- provide advice and support to centre staff
- ensure the quality and consistency of assessments within and between centres by the use of systematic sampling
- provide feedback to centres and to City & Guilds.

Learner entry requirements

City & Guilds does not set entry requirements for this qualification. Entry is at the discretion of the centre. However, centres must ensure that learners have the potential and opportunity to gain the qualifications successfully.

We recommend that centres ensure that learners hold a Level 2 qualification or above in a related area, or have relevant knowledge and experience in automotive studies, prior to starting the qualification.

Age restrictions

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

Access arrangements and special considerations

For information on how to apply for access arrangements please refer to ***How and when to apply for access arrangements and special consideration (cityandguilds.com)***

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
MCQ sample assessment	www.cityandguilds.com
Learning Assistant	www.cityandguilds.com
SmartScreen	www.smartscreen.co.uk

Recording documents

Learners and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, **Learning Assistant**, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: **www.cityandguilds.com/eportfolios**.

City & Guilds has developed a set of *recording forms* for new and existing centres to use as appropriate. *Recording forms* are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.

4 Assessment

Assessment of the qualification

Candidates must:

- successfully complete the following mandatory units: 830 and 831.

Summary of assessment methods

Candidates must successfully complete the multiple-choice questions for the essential knowledge and the practical assessment task for the skills.

Assessment Types			
Unit	**Title**	**Assessment method**	**Where to obtain assessment materials**
830	Knowledge of Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components	Multiple-choice questions	Examinations provided on e-volve
831	Skills in Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components	Practical assignment	City and Guilds/ walled garden

Assessment strategy

The knowledge will be covered by multiple-choice questions for the essential knowledge criteria and an observed practical assessment including oral questioning for the skills criteria.

Time constraints

Multiple-choice online tests

The multiple-choice online test should be scheduled for candidates only once the Knowledge unit delivery for the associated test is complete and candidates are ready to take the assessment. The test should be sat under invigilated examination conditions, as defined by the JCQ: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations**.

Practical assessments

Assessors should schedule the practical assessment for unit 831 once candidates have **passed** the Evolve on-line test for unit 830 and gained sufficient practice in order to fairly attempt the practical assessment to the best of their ability.

Candidates must complete their assessments within their registration period.

Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification. RPL is not allowed for this qualification.

Test specifications

The way the knowledge is covered by each test is laid out in the table below:

Unit 830: Knowledge of Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components		
Duration: 1 hour		
LO number	**Learning Outcome**	**Number of questions**
1	understand the health and safety and legislative procedures required to be followed when working on advanced driver assistance systems	5
2	understand the importance of customer interaction, workplace procedures and time scales	5
3	understand advanced driver assistance system components, operation, failures and calibration	5
4	understand the electrical and electronic principles relating to advanced driver assistance systems.	5
5	understand how to test, remove, replace and recalibrate components related to advanced driver assistance systems.	10
	Total	**30**

The grade boundaries for this test will be approximately:
Pass: % 60, 18 marks

This boundary may be subject to slight variation to ensure fairness should any variations in the difficulty of the test be identified.

5 Grading

Grading of individual assessments

All the assessments within this qualification are graded at a Pass only**.**

Grading of qualification

The overall grading of this qualification is Pass/Fail only.

Candidates must achieve a Pass in:

- Unit 830 Multiple-choice online test
- Unit 831 Practical Assessment

to achieve a Pass in the full qualification.

6 Units

Availability of units

All of the units can be found in this document.

Structure of the units

The units each have the following:

- City & Guilds reference number
- Title
- Level
- Guided learning hours (GLH)
- Unit aim
- Assessment type
- Learning outcomes, which are comprised of a number of assessment criteria

Centres must deliver the full breadth of the range. Specialist equipment or commodities may not be available to all centres, so centres should ensure that their delivery covers their use. This may be covered by a practical demonstration (e.g. video).

For the practical assessments for this qualification, centres should ensure that there are sufficient resources to complete the task but are not required to use all the equipment or commodities in the range.

Guidance for delivery of the units

This qualification is comprised of two **units**. A unit describes what is expected of a competent person in particular aspects of his/her job.

Each **unit** is divided into **learning outcomes** which describe in further detail the skills and knowledge that a candidate should possess.

Each **learning outcome** has a set of **assessment criteria** which specify the desired criteria that have to be satisfied before an individual can be said to have performed to the agreed standard.

Range statements define the breadth or scope of a learning outcome and its assessment criteria by setting out the various circumstances in which they are to be applied.

Unit 830 Knowledge of Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System Components

Level:	Level 3
GLH:	20
Relationship to NOS:	LV19: diagnose, remove, replace, and recalibrate motor vehicle advanced system components.
Aim:	To be able to identify and describe the function and operation of different types of advanced driver assistance systems (ADAS) and components. To understand the importance of good customer service and adhering to legislation/workplace procedures. To safely remove, test and replace components using the correct tools and equipment and following the manufacture's procedures.
Assessment type	Multiple-choice online test

Essential Knowledge

Learning outcomes

The learner will:

1. understand the health and safety and legislative procedures required to be followed when working on advanced driver assistance systems
2. understand the importance of customer interaction, workplace procedures and timescales
3. understand advanced driver assistance system components, operation, failures, and calibration
4. understand the electrical and electronic principles relating to advanced driver assistance systems
5. understand how to test, remove, replace, and recalibrate components related to advanced driver assistance systems.

Learning outcome:

The learner will:

1. understand the health and safety and legislative procedures required to be followed, when working on advanced driver assistance systems

Assessment criteria

The learner must know:

1.1 current **health and safety legislation** that must be followed when working on **advanced driver assistance systems**

1.2 current **legal requirements** relating to advanced driver assistance systems and components

1.3 the **legal requirements** of dynamic calibration activity on the road

1.4 the **risks** and potential legal **implications** of returning an uncalibrated vehicle to the customer

1.5 specific vehicle manufacturer's **repair and safety procedures**

1.6 the **impact** of **industry regulations** on **autonomous vehicle capability levels**

Range

1.1 **Health and safety legislation**

a) Health and Safety at Work Act
b) Electricity at Work Regulations
c) General Safety Regulation
d) Health and Safety Executive
e) Highway Code
f) Provision and Use of Work Equipment Regulations

1.2 **Legal Requirements**

a) Returning vehicles to their original specification
b) Confirming components are calibrated and functioning within the manufacturers' technical specifications.
c) Technician competency proof
d) Customer contract
e) Duty of care

1.3 **Legal Requirements**

a) Driving license category
b) Insurance cover
c) Highway Code
d) Road Traffic Act

e) Vehicle roadworthy

f) Road tax

g) MOT

1.4 **Risks**

a) Unexpected systems trigger

b) Potential accidents/collisions

1.4 **Implications**

a) Liability of the workshop

b) Evidence of negligence

c) Fines

d) Prosecution

e) Imprisonment

1.5 **Repair and Safety Procedures**

a) Risk assessment

b) Specific manufacturer repair methods

c) Equipment software updates

d) Calibration and maintenance of equipment

e) Use of appropriate environment

1.6 **Impact**

a) Set boundaries for levels of automation

b) Volume of automation on public roads

c) Updated raining of operators/drivers/technicians on new and evolving technology

d) Cyber security risks

1.6 **Industry regulations**

a) Insurance Industry Requirements (IIR) for the safe repair of ADAS-equipped vehicles

e) Type approval regulations

f) Automated and Electric Vehicles Act

g) General Safety Regulation

h) Pedestrian Safety Regulation

1.6 **Autonomous vehicle capability levels**

a) SAE Levels of Driving Automation

Learning outcome:

The learner will:

2. understand the importance of adhering to workplace procedures, and the value of providing a positive customer experience and keeping up to date with technology

Assessment criteria

The learner must know:

2.1 workplace procedures for:
- a) **recording** fault location and correction activities
- b) **reporting** the results of tests carried out
- c) completing and **storing documentation** relating to ADAS verifiable calibration
- d) reporting/referring problems
- e) **reporting** delays to the completion of work to managers and customers
- f) the **calibration environment** as identified by the manufacturers' instructions
- g) the use of customer questioning
- h) the use of diagnostic testing **methods**

2.2 the importance of maintaining accurate **documentation** on diagnostic and rectification activities

2.3 the **importance** of working to **agreed timescales** and keeping others informed of progress

2.4 the importance of **customer interaction** when diagnosing faults and calibrating

2.5 the **value** of providing the customer with evidence of successful calibration

2.6 the **importance** of reporting anticipated delays to the relevant person(s) promptly

2.7 the **relationship** between time, costs, and productivity

2.8 the benefits of keeping up to date with emerging ADAS technology

Range

2.1a/b/c/e **Recording/reporting/storing** ensuring
- a) Accurate records
- b) Auditable records
- c) Compliance with data protection

2.1c, 2.2 **Documentation** information to include
- a) Customer details
- b) Vehicle data
- c) Third party contracted repairer information
- d) Technician proof of competency
- e) Equipment used to test/diagnose/calibrate
- f) Date of activities
- g) The work carried out

2.1f **Calibration environment**

a) Layout
b) Floor surface/level
c) Space available
d) Lighting
e) Equipment available
    i. Target / radar boards
    ii. Computer software devices
    iii. Laser guided tools
    iv. Wheel clamps
    v. Scales
    vi. Mirrors
    vii. Alignment / positioning aids for radar sensors

2.1h **Methods**

a) Following manufacturer's instructions
b) Planning a logical sequence
c) Visual inspection
d) Vehicle scans
e) Using diagnostic software
f) Conducting electrical tests
g) Interpreting fault codes
h) Calibration procedures/checks
i) Road testing

2.3, 2.5-2.6 **Value/importance**

a) Customer satisfaction
b) Business productivity
c) Business reputation
d) Repeat business
e) Reduces risk of liability accusations

2.3 **Agreed timescales**

a) Manufacturers' recommended work times
b) Job times set by the company
c) Job time agreed with the customer

2.4 **Customer interaction**

a) Using technical and non-technical language as appropriate
b) Use of documentation for clarification
a) Confirming customer understanding

2.7 **Relationship**

a) How extended labour times can affect costs and productivity
b) The consequences of mistakes and rework and its effect on time, cost and productivity
c) The effects of uneconomical use of resources, materials / consumables
d) Methods of increasing efficiency through planning, organisation of the workspace and maintaining tools and equipment
e) How training and personal development can be advantageous to saving time, costs and being more productive

Learning outcome:

The learner will:

3. understand advanced driver assistance system components, operation, failures, and calibration

Assessment criteria

The learner must know:

3.1 the types of ADAS **sensors** and their function

3.2 the purpose and operation of **advanced driver assistance systems**

3.3 methods of sourcing information on ADAS operating specifications

3.4 how to use and interpret technical information on ADAS operating specifications

3.5 the types and causes of **ADAS failures**

3.6 the different **types** of vehicle **calibration**

Range

3.1 **Sensors**

a) Optical / cameras
b) Radar
c) Lidar
d) Ultrasonic

3.2 **Advanced driver assistance systems** to include

a) Steering
b) Braking, emergency brake assist (autonomous and ABS)
c) Lane departure / lane support systems
d) Driver assistance
e) Parking assistance
f) Collision avoidance
g) Adaptive lighting / Night vision
h) Adaptive cruise control
i) Rear-cross traffic alert
j) Intelligent speed adaption
k) Seat belt reminders
l) In-vehicle data recorders
m) Intelligent speed adaption
n) Electronic stability control
o) E-call systems

3.5 ADAS failures

a) Network faults
b) Calibration faults
c) Collision damage
d) Component failure
e) Water ingress
f) Poor connections
g) Electrical faults
h) Damage caused by incorrect testing methods
i) Damages caused by incorrect removal

3.6 Types of calibration

a) Static
b) Dynamic
c) Self-calibrating

Learning outcome:

The learner will:

4. understand the electrical and electronic principles relating to advanced driver assistance systems

Assessment criteria

The learner must know:

4.1 **electrical and electronic theories** including electrical terminology, symbols, and units
4.2 electrical safety procedures when working on advanced driver assistance systems
4.3 how electrical and electronic **units** and **components** are constructed
4.4 how electrical and electronic **units** and **components** are dismantled and reassembled
4.5 how electrical and electronic **units** and **components operate**
4.6 the interaction between electrical, electronic, and mechanical components within advanced driver assistance systems
4.7 how electrical systems **interlink and interact**

Range

4.1 **Electrical and Electronic Theories**

a) Ohms law
b) Watts law
c) Voltage
d) Power
e) Current (AC/DC)
f) Resistance
g) Magnetism
h) Electromagnetism
i) Electromagnetic induction
j) Digital and fibre optics principles
k) Radio waves
l) Time of Flight and doppler shifts (doppler shifts - the change in frequency of a wave)

4.3-4.5 **Units and components**

a) Circuit boards
b) Processors
c) Image sensors
d) Radar receivers
e) Radar transmitters
f) Laser Diode

g) Photodiode
h) Semiconductor devices
i) Electronic chips
j) Transistors
k) Resistors
l) Transducers
m) Variable resistors
n) Micro-processors
o) Capacitors
p) Electrical inputs
q) Electrical outputs

4.5 **Operation** of ADAS components

a) Component bandwidths/frequencies
b) Signal processing
c) Field of view
d) Road sign/pedestrian/object recognition
e) Distances/ranges/angle measurements
f) Monitoring of speeds and direction of motion
g) Production of high-resolution maps and images
h) Systems anticipating driver intentions and late reactions
i) Internal components operation

4.7 **Interlink and Interact**

a) Multiplexing
b) Communication networks

Learning outcome:

The learner will:

5. understand how to test, remove, replace, and recalibrate components related to advanced driver assistance systems.

Assessment criteria

The learner must know:

5.1 how to carry out systematic **diagnostic testing** of ADAS components using electrical and electronic **testing techniques**

5.2 how to identify the most appropriate **diagnostic testing** method for the symptoms presented

5.3 the types of ADAS **diagnostic equipment** and their function

5.4 how to prepare and **check** the accuracy of **diagnostic testing equipment**

5.5 how to use electrical and electronic **testing equipment** to correctly and safely diagnose ADAS faults

5.6 how to interpret vehicle data and tests results in order to identify the location and cause of ADAS faults

5.7 the circumstances which will necessitate replacement and recalibration of ADAS **components** and **other** possible **courses of action**

5.8 the importance of working to recognised **diagnostic procedures**

5.9 methods of sourcing correct information applicable to:

- a) diagnostic test procedures
- b) component removal procedures
- c) component replacement procedures
- d) system/component recalibration procedures

5.10 how to use and interpret technical information to aid:

- a) diagnostic activities
- b) component removal
- c) component replacement
- d) system/component recalibration

5.11 how to remove, replace and recalibrate vehicle or ADAS **components**, in the proximity of **sensors**

5.12 how to make cost effective recommendations for rectification

Range

5.1-5.2/5.8 **Diagnostic testing procedures**

- a) Recording relevant vehicle information
- b) Accessing current technical information
- c) Performing a full module scan
- d) Locating components

e) Evaluating the evidence / test results
f) Verifying the fault
g) Carrying out further tests / additional diagnostic testing in a logical sequence
h) Rectifying the problem
i) Checking all systems

5.1 **Testing techniques** include

a) Visual inspection
b) Voltage, resistance and current measuring
c) Frequency measuring
d) Dedicated and computer-based testing
e) Oscilloscope waveforms / checking for noise
f) Vehicle scans
g) Disconnecting components to check if fault codes are erased
h) Splicing / back probing

5.3-5.5 **Testing and diagnostic equipment**

a) Voltmeters
b) Ammeters
c) Ohmmeters
d) Dedicated and computer-based equipment
e) Fault-code readers
f) Auxiliary battery supply/charger
g) Battery testing equipment
h) Scan tools
i) Multimeters
j) Oscilloscopes
k) Calibration equipment
l) Wheel alignment equipment
m) Breakout box
n) Hand tools
o) Special purpose tools
p) General workshop equipment

5.4 **Checks** to include

a) Capability
b) Limitations
c) Software subscriptions
d) Software versions/updates
e) Equipment calibrating procedures
f) Maintenance and service contracts

5.7, 5.11 **Components**

a) Mechanical
b) Electrical
c) Electrical Control Unit (ECU's)
d) Trim
e) Sensors
f) Cameras

5.7 **Other Courses of Action** to include:

a) Action if calibration fails
b) Wheel alignment checks and adjustments
c) Steering angle reset
d) Road test

5.11 **Sensors**

a) Optical / cameras
b) Radar
c) Lidar
d) Ultrasonic

Unit 831 Skills in Diagnosing, Removing, Replacing and Recalibrating Motor Vehicle Advanced Driver Assistance System components

Level:	Level 3
GLH:	7
Relationship to NOS:	LV19: diagnose, remove, replace, and recalibrate motor vehicle Advanced System components
Aim:	To be able to demonstrate how to safely test, diagnose, repair and recalibrate Advanced Driver Assist Systems.
Assessment type	Observed practical assessment and verbal questioning

Learning outcome:

The learner will:

1. be able to demonstrate safe and appropriate working methods when carrying out diagnostic and rectification activities of advanced driver assistance systems and components

Assessment criteria

The learner must:

1.1 select and use the correct personal protective equipment (PPE) when carrying out testing, diagnosis, and rectification activities

1.2 select and use the appropriate vehicle protective equipment (VPE) when carrying out testing, diagnosis, and rectification activities

1.3 ensure the work area is clearly identified using signs and barriers as appropriate, following environmental standards and regulations at all times

1.4 work in a way which minimises risk of:

- a) injury to themselves
- b) damage to other vehicle systems, components and units
- c) contact with leakages
- d) contact with hazardous substances

1.5 follow relevant up-to-date **industry codes of practice** at all times

1.6 prepare and check the required **testing and diagnostic equipment** following legislative and manufacturer's instructions, prior to use

1.7 carry out a **dynamic risk assessment** on vehicle and work area, prior to use

Range

1.5 **Industry Codes of Practice** to include

a) UK Insurance Industry Requirements (IIR) for the safe repair of ADAS-equipped vehicles
b) Type approval regulations
c) Automated and Electric Vehicles Act
d) General Safety Regulation
e) Pedestrian Safety Regulation

1.6 **Testing and diagnostic equipment**

a) Voltmeters
b) Ammeters
c) Ohmmeters
d) Dedicated and computer-based equipment
e) Fault-code readers
f) Auxiliary battery supply/charger
g) Battery testing equipment
h) Scan tools
i) Multimeters
j) Oscilloscopes
k) Calibration equipment
l) Wheel alignment equipment
m) Breakout box
n) Hand tools
o) Special purpose tools
p) General workshop equipment (including target boards, radar boards, measurement equipment)

1.7 **Dynamic risk assessment** procedures include

a) Risk assessment documentation and responsible persons
b) Taking action to eliminate or reduce risk
c) Observing, assessing, analysing an environment while working, to identify and remove risk
d) Monitoring situation
e) Reviewing situation

Learning outcome:

The learner will:

2. be able to diagnose advanced driver assistance system faults, in a safe, methodical and efficient manner

Assessment criteria

The learner must:

2.1 confirm and record presence and type of advanced driver assistance systems and **sensors**

2.2 support the identification of advanced driver assistance system **faults** by sourcing and interpreting vehicle technical information/data

2.3 select and use the required diagnostic and rectification **tools and equipment** correctly and safely

2.4 use **testing techniques** which are relevant to the symptoms presented and advanced driver assistance system type

2.5 collect and record sufficient diagnostic information in a logical and systematic way to enable an accurate diagnosis of advanced driver assistance system **faults**

2.6 identify and record accurately any system deviation from acceptable limits as per manufacturer's specifications or industry standards

2.7 assess components and units to establish their condition and suitability for repair or replacement

2.8 carry out **diagnostic testing procedures** and all diagnostic activities following:

a) manufacturers' instructions

b) health, safety and environmental requirements

d) workplace procedures

2.9 analyse the diagnostic information to produce a cost effective, accurate recommendation for rectification

Range

3.1 **Sensors**

a) Optical / cameras
b) Radar
c) Lidar
d) Ultrasonic

2.2, 2.5 **Faults** that occur within

a) Driver safety systems
b) Pedestrian safety systems
c) Motion/stability systems
d) Collision avoidance systems

2.3 **Tools and equipment**

a) Voltmeters
b) Ammeters
c) Ohmmeters
d) Dedicated and computer-based equipment
e) Fault-code readers
f) Auxiliary battery supply/charger
g) Battery testing equipment
h) Scan tools
i) Multimeters
j) Oscilloscopes
k) Calibration equipment
l) Wheel alignment equipment
m) Breakout box
n) Hand tools
o) Special purpose tools
p) General workshop equipment (including target boards, radar boards, measurement equipment)

2.4 **Testing techniques** include

a) Visual inspection
b) Voltage, resistance and current measuring
c) Frequency measuring
d) Dedicated and computer-based testing
e) Oscilloscope waveforms / checking for noise
f) Vehicle scans
g) Disconnecting components to check if fault codes are erased
h) Splicing / back probing

2.8 **Diagnostic testing procedures**

a) Recording relevant vehicle information
b) Accessing current technical information
c) Performing a full module scan
d) Locating components
e) Evaluating the evidence / test results
f) Verifying the fault
g) Carrying out further tests / additional diagnostic testing in a logical sequence
h) Rectifying the problem
i) Checking all systems

Learning outcome:

The learner will:

3. be able to effectively communicate with colleagues, supervisors, and customers throughout the diagnostic and rectification process

Assessment criteria

The learner must:

3.1 produce **records** that are accurate, complete, and passed to the relevant person(s) within the agreed timescale

3.2 report any anticipated delays in completion of diagnosis and rectification work to the relevant person(s) promptly and effectively

3.3 complete all diagnostic and rectification activities within the agreed timescale

Range

3.1 **Records** to include

a) Customer details
b) Vehicle data
c) Third party contracted repairer information
d) Technician proof of competency
e) Equipment used to test/diagnose/calibrate
f) Date of activities
g) The work carried out

Learning outcome:

The learner will:

4. be able to remove, replace and recalibrate advanced driver assistance system components

Assessment criteria

The learner must:

4.1 carry out **component** removal and replacement activities following:
- a) manufacturers' instructions
- b) b) industry recognised replacement methods
- c) c) health, safety and environmental requirements

4.2 carry out rectification activities following:
- a) manufacturers' instructions
- b) industry recognised replacement methods
- c) health, safety and environmental requirements

4.3 ensure the **calibration environment** is as identified by the manufacturer's instructions

4.4 ensure all replacement components and parts in the proximity of **sensors** conform to the vehicle manufacturer's specification and any legal requirements

4.5 **recalibrate** advanced driver assistance system sensors correctly to ensure that they operate to meet vehicle system requirements and function to the vehicle manufacturer's specified tolerances

4.6 record that recalibration has been successfully completed and meets vehicle manufacturer's specified tolerances

Range

4.1 **Component** types
- a) Mechanical
- b) Electrical
- c) Electrical Control Unit (ECU's)
- d) Trim
- e) Sensors
- f) Cameras

4.2 **Calibration environment**
- a) Layout
- b) Floor surface/level
- c) Space available
- d) Lighting
- e) Equipment available

viii. Target / radar boards
ix. Computer software devices
x. Laser guided tools
xi. Wheel clamps
xii. Scales
xiii. Mirrors
xiv. Alignment / positioning aids for radar sensors

4.3 **Sensors**

a) Optical / cameras
b) Radar
c) Lidar
d) Ultra-sonic

4.3 **Recalibrate**

a) Static systems
b) Dynamic systems
c) Self-calibrating systems

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 ***Centre Document Library*** on ***www.cityandguilds.com*** or click on the links below:

Quality Assurance Standards: Centre Handbook

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on

- Centre quality assurance criteria and monitoring activities
- Administration and assessment systems
- Centre-facing support teams at City & Guilds / ILM
- Centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the Centre Contract.

Quality Assurance Standards: Centre Assessment

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.

It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements, or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre-assessments.

Any centre-based assessments must be carried out in line with our Centre Assessment Standards Scrutiny (CASS) Strategy which can be found on ***www.cityandguilds.com***.

Access arrangements - When and how applications need to be made to City & Guilds 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 Document Library*** also contains useful information on such things as:

- Conducting examinations
- Registering learners
- Appeals and malpractice
- Reasonable adjustments

Useful contacts

Please visit the Contact Us section of the City & Guilds website, ***Contact us***

City & Guilds

For over 140 years we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments and credentials that lead to jobs and meet the changing needs of industry.

We partner with our customers to deliver work-based learning programmes that build competency to support better prospects for people, organisations and wider society. We create flexible learning pathways that support lifelong employability, because we believe that people deserve the opportunity to (re)train and (re)learn again and again – gaining new skills at every stage of life, regardless of where they start.

The City & Guilds community of brands includes Gen2, ILM, Intertrain, Kineo and The Oxford Group.

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EC1A 9DE

cityandguildsgroup.com