HM Government

T-LEVELS

T Level Technical Qualification in Design and Development for Engineering and Manufacturing

Control and Instrumentation Engineering Occupational Specialism (8714-323)

Practical Assignment

SAMPLE Assessor Pack

September 2025 Version 4.0

City & Guilds

Version and date	Change detail	Section
1.0 September 2022	First Published Version	
2.0 January 2023	Correction of lux value	Design criteria
3.0 February 2024	Resources section added to Task 3 for clarity	Task 3 – Resources
	Resources updated in Task 1 for clarity	Task 1 – Resources
	What must be produced for marking guidance	Task 1 – What must be produced for marking
	Task 4 candidate guidance amended for clarity	Task 4
	Resources updated	Task 4 – Resources
	Additional guidance on video evidence in Task 2	Task specific guidance – overview
	Minor amendment to wording.	Task specific guidance – overview
	Assessment theme – Design and planning	Task 1 – evidence updated
3.1 February 2025	Update to page numbers	Contents Page
4.0 September 2025	Refinement of layout and formatting Removal of duplicated guidance information	All 1. Assessment 2. Tasks

Contents

1. Assessment

The assessment for Control and Instrumentation Engineering Occupational Specialism component consists of a practical assignment that includes an brief assignment and then a number of tasks for the candidate to complete. Tasks are assessed by assessment themes that cover a range of knowledge and skills from the performance outcomes.
They are designed to allow judgement of the candidate to be made across different categories of performance.

The assessment for this component has been allocated a set number of marks against each assessment theme, based on weightings recommended by stakeholders of the qualification. This mark allocation remains the same for all versions of the assessments, ensuring consistency across assessment versions and over time.

The live Occupational Specialism assessment materials must be used in conjunction with the 'TQ Occupational Specialism assessment process guide', this is available on the T Levels Resource Hub.

Performance outcomes

The weightings for each performance outcome will remain the same for every version of the practical assignment. This ensures the appropriate depth and breadth of knowledge and skills for each specialism can be reliably assessed in every version and meets the needs of industry whilekeeping comparability between each assessment over time.

Performance outcome	Typical knowledge and skills	Weighting
PO2 Analyse and interpret control and instrumentation engineering and manufacturing requirements, systems, processes, technical drawings and specifications.	Analyse and interpret engineering and manufacturing requirements, systems, processes, technical drawings, diagrams and specifications.	16%
PO3 Evaluate systems, designs, components and processes, managing and integrating design information, proposals and specifications, to develop and improve control and instrumentation-related engineering and manufacturing proposals and solutions.	Evaluate systems, designs, components and processes, managing and integrating design information, proposals and specifications, to develop and improve control and instrumentation engineering and manufacturing proposals and solutions.	22%
PO4 Propose and design control and instrumentation-related engineering and manufacturing systems, products, components, processes and solutions, considering requirements, constraints and context.	Design and model control and instrumentation concepts, systems and diagrams. Use CAD software to produce diagrams, models and simulations. Use tools safely and effectively for specific purposes. Safely carry out engineering processes and activities.	23%
PO5 Collaborate to help manage, develop, test and quality assure control and instrumentation related engineering and manufacturing design information, systems, processes and outcomes.	Work in accordance with professional standards, work-place policies, health and safety requirements and regulations. Complete detailed risk analysis. Respond to feedback from others to inform design decisions. Develop and test models and prototypes.	26%
PO6 Communicate proposals, design information and solutions, producing, recording and explaining engineering and manufacturing representations, systems, processes, outcomes, design specifications and technical drawings.	Use methods to communicate proposals, design ideas and solutions. Produce technical documentation using industry conventions.	13%

2. Task guidance

General task guidance

Read **ALL** information carefully before the assessment.

The following documents, available on the City & Guilds website, provide essential generic guidance for providers delivering T level Technical Qualifications (TQs) and **must** be referred to alongside this guidance:

- **T level Technical Qualifications – teaching, learning and assessment guide**
- **TQ Occupational Specialism assessment process guide**

Ensure you are familiar with the following documentation before you undertake the assessment of candidates:

- Practical Observation (PO) template
- Peer review (PR) form (where applicable)
- Templates provided for tasks (where applicable)
- Marking grids

All work carried out should be to industry standards, undertaken in a safe manner and compliant with relevant regulations. If a candidate fails to carry out the activities in a safe manner, the assignment should be suspended until this aspect is corrected.

This assignment is designed to require the candidate to make use of their knowledge, understanding and the practical skills they have built up over the course of their learning to tackle tasks/problems/challenges. This approach to assessment emphasises to candidates the importance and applicability of the full range of their learning to practice in their industry area and supports them in learning to take responsibility for transferring their knowledge, understanding and skills to the practical situation, fostering independence, autonomy and confidence.

During the learning programme, it is expected that tutors will have taken the opportunity to set shorter, formative tasks that allow candidates to be supported to independently use the learning they have so far covered, drawing this together in a similar way, so they are familiar with the format, conditions and expectations of the assessment.

Candidates should be made aware during learning what the assessment themes are and how they are implemented in marking the assignment, so they will understand the level of performance that will achieve them high marks.

Candidates should not be entered for the assessment until the end of the course of learning for the qualification, so they are in a position to complete the assessment successfully.

Health and safety
Candidates must not be entered for assessment without being clear of the importance of working safely and having attended sufficient practical training to be able to work safely. The assessor must immediately stop an assessment if a candidate works unsafely. At the discretion of the assessor, depending on the severity of the incident, the candidate may be given a warning. If they continue to work unsafely, risking the safety of themselves or others however, their assessment must be ended, and they must retake the assessment in a future series after significant further training has taken place. Any warnings issued to a candidate must be considered as part of the marking process and recorded on the candidate record form (CRF). Any actions that have led to that warning must be detailed on the CRF so they can be considered along with the other evidence when applying the descriptors in the mark scheme.

Compliance with timings
Due to the nature of this assessment, the maximum time allowances provided must be adhered to. They refer directly to assessment time, not any additional setting up times the provider needs to create an appropriate assessment environment.

It is the provider's responsibility to plan sufficient assessment sessions as stated in each of the tasks, under the appropriate conditions, within the assessment window, to allow candidates reasonable time to complete the assessment tasks.

Where candidates are required to plan their work, they should have their plans confirmed for appropriateness in relation to the time allocated for each task, to ensure their planning has not left them with too short a time to complete the tasks safely. Any planning that is not appropriate must be recorded on the candidate record form (CRF) as part of the marking process.

Candidates should be allowed sufficient time to fully demonstrate the range of their skills, however this also needs to be reasonable and practicable. Candidates should be allowed to overrun their own planned timings in order for evidence of a range of their skills to be captured. If, however, the time required exceeds the maximum time allowance for the task, the provider must stop the assessment and base the marking on the evidence up to that point.

Assessor candidate ratios
Where the tutor/assessor is required to carry out observation of performance, detailed, descriptive notes must be recorded on the practical observation (PO) form provided. The provider has the flexibility to adapt the form to suit local requirements (e.g. to use electronic and hand-written formats) as long as this does not change or restrict the type of evidence collected.

The number of candidates an assessor will be able to observe at one time will vary depending on local conditions relating to:

- monitoring and maintaining safety during assessment
    - any specific hazards related to the task that pose a risk of harm in relation to the competence of the candidates
    - availability of supervisory staff to support the assessor
- the practicalities of collecting evidence
    - the complexity of evidence collection for the task
    - whether there are any peak times where there is a lot of evidence to collect that will need additional support or any that are quieter which may be eased through staggered starts etc
    - local conditions e.g.
        - layout of the assessment environment and sufficient assessor line of sight to task activity throughout the assessment period
        - amount of additional support available (e.g. to capture image/video evidence)
        - availability of suitable workspaces/bays or of shared resources and equipment.

Providers are advised to trial the planned arrangements during formative assessment, reviewing the quality of evidence captured and manageability. It is expected that for straight forward observations, with favourable local conditions and support, (and unless otherwise specified) no more than six candidates will be observed by a single assessor at one time, and the number will usually be fewer than this maximum. The key factors to consider are the logistics of collecting sufficient evidence and ability to remain working safely in the assessment environment.

A timetable of assessments and layout of the workspaces must be available for the moderator on request. This should detail:

- the candidates being assessed at each workstation,
- the assessor(s) and
- support staff present.

Time

The time allocated for the completion of the tasks and production of evidence for this assessmentis 34 hours. Timings for completion of specific tasks are outlined below.

- Task 1 – 14 hours
- Task 2 – 13 hours
- Task 3 – 1 hour
- Task 4 – 6 hours.

General task requirements

- The assignment brief and any associated documents should be released to candidates at the start of the first scheduled task assessment. Candidates should be provided with 30 minutes of non-assessed time at the start of this session to read and review the brief, before being provided the first task. It must be made clear to candidates when the 30 minutes of non-assessed reading and review time starts and ends.
- Each task **must** only be released to candidates at the start of the scheduled assessment session for that individual task.
- Each task will provide details of what evidence must be submitted on the completion of the task. Additional evidence which must also be submitted will be detailed within the task.
- Candidates should be advised that approximate word counts, or page lengths have been given within the task guidance in order to act as a guide to support the completion of the tasks. These are provided as a guide only, and there will be no penalisation of marking based on if the word count or page length is above or below the indicative guidance provided.
- Candidates are not permitted to bring any existing notes or materials completed prior to the assessment into any of the assessment sessions.
- Candidates must be reminded that their work submitted, including drawings, sketches and calculations are legible and appropriately labelled with name and task, evidence can either be word processed or handwritten. Any electronic evidence produced must have a clear file name and easily identifiable to the task and candidate.
- Candidates are permitted to have copies of their final evidence from previous tasks in subsequent assessment sessions. The use of this evidence is solely to support candidates to refer to previous work. The purpose of only providing copies is to ensure that candidates are unable to rework any of their previous responses.
- When working under supervised conditions for longer sessions, breaks can be facilitated outside of the controlled conditions, ensuring the room is locked and all candidates have vacated once the break begins. All materials must be kept securely during the break.
- If the task completion runs over more than one session, candidates must be reminded that no assessment information can be shared or discussed with other candidates.
- Candidates must be made aware that plagiarism is not allowed.
- Candidates must be made aware of City & Guilds position on the use of Artificial Intelligence (AI) Position Statement on AI | City & Guilds
- Where evidence is created using software which has the potential for cloud-based retrieval or sharing this feature should be disabled where possible (e.g. in software settings or through restriction of internet connection). Where not possible, candidates must be reminded that the evidence submitted for the tasks can only be generated within the scheduled assessment times and also of the implications of sharing or plagiarising content from cloud-based content.
- After the production of evidence, both the assessor and candidate must sign declarations of authenticity.
- Where the candidate or assessor is unable to or does not confirm authenticity through signing a declaration form, the work will not be accepted and a mark of zero will be given. If any question of authenticity arises, the Provider may be contacted for justification of authentication

Task specific guidance

Each task should be administered separately and in order unless instructions state otherwise, and each task should be completed and submitted by all candidates before moving onto the next.

Where a candidate is required to update or refer to a document from a previous task, the document provided to them should be a copy of the original submitted evidence. This can be a hard copy or electronic. Candidates must not be permitted access to their original document from previous task, this is to prevent candidates reworking submitted evidence. Any annotations or amendments to the copy should be made in a different colour text or tracked electronically (e.g. tracked changes) for marking and moderation purposes and saved in a secure location with an appropriate file name.

Providers are not permitted to supply candidates with templates e.g. risk assessment for any task unless specified.

Task 1

Assessor guidance

- As a pre alarm must sound when the temperature is nearing the set limits, the candidate must determine the lower and upper temperatures based on the design criteria (180C - 240C) that activates the alarm.
- Evidence of the virtual modelling should be captured using annotated screen captures or print outs.
- Candidate must produce a detailed design specification that builds on the design criteria given in the assignment brief, including any references to research used. The specification should include:
    - a definition of the operating limits of the system
    - an analysis of how system stability will be achieved
- Candidate must generate a suitable design for the control system, including:
    - annotated sketches, block and wiring diagrams for the system that show how it will function
    - selection of appropriate sensors with justifications, and all relevant calculations
    - selection of appropriate pre alarm temperatures with justifications and all relevant calculations.

  (The exact position of the pre alarm range limits will be determined by the design of your system)
- Candidate must produce a virtual model of the proposed design using appropriate software
- Candidate must create a bill of materials (BoM) listing all of the parts required in their final design proposal.

Evidence

- Design specification
- Annotated sketches, block and wiring diagrams
- Design options for the sensors with justifications, and calculations
- Selection of appropriate pre alarm temperatures with justifications and calculations, including all workings
- Outcomes of the virtual modelling of the proposed system design, either as screen captures or printouts
- Bill of materials
- Any notes produced of research undertaken including citation of sources and internet search history must be submitted to ensure the authenticity of evidence produced.

Resources

- Access to the internet for research purposes
- Access to appropriate virtual modelling and CAD software
- Manufacturer's datasheets for component parts

- Manufacturer’s instructions for component parts
- Scientific calculator.

Task 2

Assessor guidance

- Candidates could use any combination of programmable and non-programmable hardware in the design and production of their prototype.
- The physical prototype must be functional and made using a permanent construction method.
- Work area must be representative of normal centre practice prior to any practical activities taking place for candidates to complete their work area preparation.
- Candidates must have access to appropriate materials, tools, equipment and machinery in order for them to manufacture their prototype.
- As part of the testing and verification within this task (2c), candidates are required to clearly capture and record their findings in an appropriate format, such as a table.
- Video evidence should show the functional test being carried out on the prototype to a maximum of five minutes.
- Candidates must produce a risk assessment for the construction of the prototype.
- Candidates must use a permanent construction method to produce the prototype.
- Candidates must test and verify the operation of the completed prototype, recording their findings.

Evidence

- Risk assessment
- Prototype
- Test and verification records
- Assessor observation of the construction of the prototype
- Assessor observation of the testing and verification.

To support the comments made within the Practical Observation the assessor must capture the following photographs that must be submitted as supporting evidence for each candidate.

Photographic evidence which shows:

- Sequence of photos during the construction of the prototype to include:
  - results of tool selection and usage
  - wiring – dressing of cables
  - control hardware
  - interfaces
  - sub-assemblies
  - final prototype.

Video evidence which shows:

- functionality of the prototype (maximum of five minutes).

Resources

- Copies of completed documentation from task 1
- Appropriate materials, components and facilities to produce the prototype
- Test environment
- Appropriate test and verification equipment, such as multimeters, logic probes etc.

Task 3

Assessor guidance

- Task 3 must take place in a single assessment session on the same day.
- The assessor must ensure the following requirements are met:
- Organise candidates into groups (recommend three candidates per group) for the discussions. Where this is not possible i.e. candidate absence group sizes may be flexed but should be closely monitored by the assessor to ensure comparable experience is achieved for all candidates
- Ensure access to candidate resources as directed in the task information
- The task should be candidate led but the assessor may facilitate through prompting to support the level of engagement and feedback gained for candidates
- Monitor timings as directed by the task
- The discussion takes place in an appropriate environment where candidates are unlikely to be disturbed
- Check all completed peer review forms for appropriateness before sharing with the candidate whose evidence is being reviewed
- Further guidance is provided within Task 3 ‘guidance to assessor’ section.
- Following tasks, copies of the final submitted evidence from preceding tasks should be saved securely for return to candidates for use in future tasks within this assessment. This could be facilitated through the use of memory sticks or a specific location on a secure drive for work to be saved on.

Evidence

- Feedback record form
- Peer review feedback form.

Resources

- Copies of completed documentation from Task 1
- Feedback record form
- Peer review feedback form(s).

Task 4

Assessor guidance

- Candidates must update the virtual model of the design using appropriate software incorporating any changes they have decided to make in response to feedback or as a result of manufacturing and testing
- Candidates must produce a revision control document or report that is typically 500 words justifying why changes were made or not made as a result of the peer review feedback
- Candidates must produce a report evaluating the design work completed. The report should typically be 800 words. This must include:
  - an explanation of the test methods used, reasons for their use and their limitations
  - an evaluation of the fitness for purpose of the design proposal and its conformance to the design criteria and specification
  - the information necessary for a third party to implement their design, including commissioning procedures and health and safety considerations
  - any further improvements or adaptations to the design including any reasoning, and justifications if adaptions or improvements are not required.

Evidence

- Outcomes of virtual modelling
- Revision control document
- Evaluation and implementation report.

Resources

- Copies of completed documentation from Tasks 1 and 2
- Feedback record form and peer review form from Task 3
- Internet access for research (e.g. costs, component data and production information)
- Manufacturer's datasheets (for materials and components).

3. Marking

Guidance on marking

Please refer to the **TQ Occupational Specialism Assessment process guide** document for further information on gathering evidence suitable for marking and moderation, and on using the marking grid and forms.

The Candidate Record Form (CRF) is used to record:

- details of any guidance or the level of prompting the candidate has received during theassessment period
- rough notes bringing together relevant evidence from across tasks during marking
- summary justifications when holistically coming to an overall judgement of the mark foreach performance objective and overall
- if an assessment has to be stopped on the grounds of Health and Safety or if a candidatehas been working in an unsafe manner.

The Practical Observation form (PO) is used to record:

- descriptive information and evidence of candidate performance during an observation.

4. Marking grid

There is a marking grid for each assessment theme that must be assessed as part of this occupational specialism assessment. The individual statements within the band descriptors should be treated together to make one whole descriptor and not separately.

Assessment theme – Health and Safety

Guidance for assessors

The following evidence from Tasks 1, 2 and 4 should be used to assess performance against this assessment theme.

Task 1

- Design specification.

Task 2

- Risk assessment
- Assessor observations:
  - the construction of the prototype
  - the testing and verification.

Task 4

- Evaluation and implementation report.

Additional supporting evidence

- Photographic and/or video evidence requirements are stated in the specific task guidance for each task within this assessor pack.

	Band 1 descriptor	Band 2 descriptor	Band 3 descriptor	Total marks per sub assessment theme	Total marks per assessment theme

Note: where there is insufficient evidence to award a mark, a zero mark must be given	**Indicative content**
	Completion of a comprehensive risk assessment, including:
	• identification of risks and hazards that if not controlled could cause injury to themselves or others, that may include:
	  ○ low risk – slips, trips and falls
	  ○ medium risk – working in high temperatures (burns and scaling), flying debris, personal injury from use of tools
	  ○ high risk – electric shock
	• analysis of risk with appropriate mitigation and control measures prepared against hazards for planned tasks, including PPE, extraction, isolation
	• assessment of risk as part planning and preparing for manufacturing and testing activities, including health and safety preparatory checks on tools and equipment and the work area.
	
	Manufacture and testing of prototype:
	• correct preparation of tools, prototype manufacture and assembly equipment and PPE for the proposed design
	• work area to be kept tidy throughout the tasks
	• wearing the correct PPE at all times, as identified in their risk assessment
	• following safe work practices throughout the manufacture, development and testing of the prototype e.g. safe use of tools and equipment e.g. wire cutters, crimping tools.
	
	Completion of a design specification for the control system to include consideration to:
	• safe use of power supplies
	• safe assembly and manufacture of the control system
	• testing requirements to ensure safe operation
	• methods to avoid trip hazards
	• health and safety legislations and regulations and local workplace procedures (use of tools and equipment, measurement, wiring regulations, LOLER).
	
	Completion of an evaluation and implementation report with consideration of:
	• health and safety legislations and regulations (working at height, wiring regulations, LOLER)
	• wider implications of both the construction and operation of the control system e.g. environmental considerations, capabilities of human operators, ergonomics
	• measures required to work on systems, wiring and cables
	• location in which activity is carried out.			

Marks per band	1-4	5-8	9-12	N/A	12
	Risk assessment covers the **majority** of risk factors and **some** control measures have been identified. Likelihood or severity has been considered for **some** risks and hazards. Risk mitigation methods are **limited**.	Risk assessment covers a **good** range of risk factors, including risk control measures identified for **most** of the potential risks and hazards. Likelihood and severity have been considered for **most** risks and hazards. Risk mitigation methods have been identified for **some** of the potential risks, **but not all**.	Risk assessment is detailed and clearly identifies **all** of the associated risk factors, risk control measures and have been clearly identified for **all** potential risks and hazards. Likelihood and severity have been considered for **all** risks and hazards. Risk mitigation methods are detailed and have been clearly identified for **all** potential risks.		
	Health and safety is followed during preparation and throughout the tasks so that all work is completed safely. **Some** risks and hazards that occur during the tasks are mitigated against as they arise.	Health and safety is followed during preparationand throughout tasks and all work completed safely. **Most** risks and hazards that occur during the tasks are correctly mitigated against as they arise.	Health and safety is followed during preparation and throughout tasks and all work completed safely. **All** risks and hazards that occur during the tasks are correctly mitigated against as they arise.		
	Minimal health and safety considerations have been included as part of the design and evaluation/ implementation.	A **good** range of health and safety considerations have been included as part of the design and evaluation/ implementation.	A **comprehensive** range of health and safety considerations have been considered as part of the design and evaluation/ implementation.		

Assessment theme – Design and Planning

Guidance for assessors

The following evidence from Tasks 1 and 4 should be used to assess performance against this assessment theme.

Task 1

- Design specification
- Design options for the sensors with justifications, and calculations
- Bill of materials
- Annotated sketches, block and wiring diagrams
- Selection of appropriate pre alarm temperatures with justifications and calculations, including all workings
- Outcomes of the virtual modelling of the proposed system design, either as screen captures or printouts.

Task 4

- Outcomes of virtual modelling.

Note: where there is insufficient evidence to award a mark, a zero mark must be given	Band 1 descriptor	Band 2 descriptor	Band 3 descriptor	Total marks per sub assessment theme	Total marks for assessment theme

	Indicative content:
	
	Documents
	• Analysis and interpretation of design criteria
	• The appropriate selection of technology, components, sub-systems, tools and sensors
	  ○ sensors: light sensor e.g. LDR or photo diode. Temperature sensors e.g. thermistor or IC
	  ○ technologies, components and sub-systems: potential dividers, Op-Amp 4000 series logic, 74 series logic, PAL, FPGA, PID controller, PLC, microcontroller or alternatives
	• The appropriate selection of materials and components and sub-systems required to meet the design criteria and specification with justifications for the selections
	• Accuracy and precision of sensors				

	• Sustainability considerations and requirements e.g. use of renewable energy, safe disposal of components and sub-systems, designing for recycling and re-use, circular economy • Heating and cooling response characteristics • The type, size and quantity of materials, components and sub-systems required to complete the tasks to ensure the highest quality, which shows no evidence of damage to systems, sensors, wiring etc • Design calculations e.g. calculate coefficient of a three term controller (Proportional Integral Derivative) • Scientific principles e.g. closed loop, use of feedback loops. **Drawings and diagrams** • Engineering diagrams and representations (wiring diagrams, block diagrams, sketches, schematics) o block diagrams include separate feedback loops for light and temperature control o wiring diagrams include type of wire, connection types and grounding o schematics including correct abbreviations and symbols for light and temperature sensors, processing device, sound output for the pre alarm, and visual output and recording device • Industry standard conventions, symbols, abbreviations, references and annotations. **Virtual modelling** • Use of virtual modelling tools or CAD to prepare a virtual model of the control system • Use the virtual model to simulate function of light and temperature sensors, overshoots, pre alarm and visual outputs.				
Marks per band	**1-4**	**5-8**	**9-12**	**12**	**33**
Documents	Specification is **brief** with **minor inaccuracies** in technical knowledge. **Most** points have been analysed, considered and elaborated on.	Specification is **clear** with **minor inaccuracies** in technical knowledge. **All** points have been analysed, considered and **most** have been elaborated on.	Specification is **detailed and thorough** with **accurate** technical knowledge throughout. **All** points have been analysed, considered and elaborated on.		
	Some key materials and quantities to meet the brief have been identified.	**Most** key materials, quantities required to meet the brief have been identified.	**All** materials and quantities required to meet the brief have been identified.		
	No reasoning provided to justify choices made for selection of materials.	**Some** reasoning provided to justify choices made for selection of materials.	**Clear and detailed** reasoning provided to justify choices made for selection of materials.		

	Some design calculations are accurate. **Some** correct methodology applied.	**Most** design calculations are accurate. **Most** correct methodology applied.	**All** design calculations are accurate. Methodology **correctly applied throughout** and reference to industry standards annotated.		
Marks per band	**1-4**	**5-8**	**9-12**	**12**	
Drawings and diagrams	Drawings/diagrams are produced using **some** correct conventions.	Drawings/diagrams are produced using **most** correct conventions.	Drawings/diagrams produced with **fully** compliant and correct conventions.		
	Drawings/diagrams are clear and contain **some** of the appropriate information needed in order for a third party to reproduce them.	Drawings/diagrams are clear and contain **most** of the appropriate information needed in order for a third party to reproduce them.	Drawings/diagrams are clear and well presented and contain **all** of the appropriate information needed in order for a third party to reproduce them.		
	Sketches include **brief** annotations and **some** relevant information.	Sketches are **clearly** annotated and contain **most** relevant information.	Sketches are annotated in **detail** and contain **all** relevant information.		
Marks per band	**1-3**	**4-6**	**7-9**	**9**	
Virtual modelling	Use of virtual modelling tools is **basic**.	Use of virtual modelling tools is **good**.	Use of virtual modelling tools is **comprehensive**.		
	Virtual model(s) is functional and meets **some** of the requirements of the design criteria.	Virtual model(s) is functional and meets **most** of the requirements of the design criteria.	Virtual model(s) is functional and meets **all** requirements of the design criteria, **including any changes/ modifications** required.		

Assessment theme – Manufacturing

Guidance for assessors

The following evidence from Task 2 should be used to assess performance against this assessment theme.

Task 2

- Test and verification records
- Assessor observations:
  - the construction of the prototype
  - testing and verification.

Additional supporting evidence

- Photographic and/or video evidence requirements are stated in the specific task guidance for each task within this assessor pack.

Note: where there is insufficient evidence to award a mark, a zero mark must be given	Band 1 descriptor	Band 2 descriptor	Band 3 descriptor	Total marks per sub assessment theme	Total marks for assessment theme
	Indicative content: **Developing the prototype/model**: • the appropriate selection and use of components, sub-systems, tools, equipment and processes • hand skills e.g. wiring and cabling of light and temperature sensors and output devices, manufacture of display control panel • skills to construct the prototype e.g. cabling and wiring connections, assembly of sub-system and system blocks • measuring and cutting of components, materials, wiring and cables using appropriate tools and equipment • use of glue, screws, bolts, crimps and other fixing mechanisms to assemble the control system • screw connections are tightened, correctly matched crimps and wires, no exposed wiring or connections, appropriate circuit protection methods used, fully tested PLC programming where relevant.				

	Tests from the range below: • use of electrical measurement and test equipment (e.g. multimeter, oscilloscope, logic probe) to measure input and output signal parameters for both the full system and individual sub-systems – light and temperature sensors, process and control devices (e.g. PLC, logic system, microcontroller), pre-alarm sounder and visual output (e.g, voltage, current, resistance and characteristic of signal waveforms) • use of manual and automated testing processes, such as functional testing and visual inspection, to test against each point of the design criteria listed in the brief. e.g. adjusting the temperature to different levels to check that the pre-alarm and visual output devices respond as specified • internal control testing monitoring points e.g. integral, derivative and proportional part of the three term controller.				
Marks per band	**1-3**	**4-6**	**7-9**	**9**	**27**
Prototype/ model	The prototype/model is mainly appropriate but may require **significant** modifications.	The prototype/model is mainly appropriate and functional but may require some **minor** modifications.	The prototype/model is functional **without** modification.		
	The prototype/model meets **some** of the requirements of the design criteria.	The prototype/model meets **most** of the requirements of the design criteria.	The prototype/model meets **all** of the requirements of the design criteria.		
Marks per band	**1-2**	**3-4**	**5-6**	**6**	
Developing	Selection of tools, equipment and processes are **sometimes** limited to the appropriateness of the task.	Selection of tools, equipment and processes is **mostly** appropriate to the task.	Selection of tools, equipment and processes is **always** appropriate to the task.		
	Use of tools, equipment and processes is **basic**, resulting in a finish that is of **poor quality**.	Use of tools, equipment and processes is **good** resulting in a finish that is of **adequate quality**.	Use of tools, equipment and processes is **excellent**, resulting in a finish that is of **high-quality**.		

Marks per band	1-4	5-8	9-12	12	
Testing	**Some** understanding shown through selection of tests, **some** appropriate tests carried out in order to check the prototype/ model functionality meets the design criteria.	**Good** understanding shown through selection of tests, **most** appropriate tests carried out in order to check the prototype/ model functionality meets the design criteria.	**Comprehensive** understanding shown through selection of tests, **all** appropriate tests carried out in order to check the prototype/model functionality meets the design criteria.		
	The model has been tested against **some** of the design criteria and meets **some** of the requirements.	The model has been tested against **most** of the design criteria and meets **most** of the requirements.	The model has been tested against **all** of the design criteria and meets **all** of the requirements.		
	Selection and use of testing and measurement equipment is **mostly** appropriate and carried out with **some errors** in accuracy.	Selection and use of testing and measurement equipment is **mostly** appropriate and carried out **accurately**.	Selection and use of testing and measurement equipment is **always** appropriate to the task and carried out with a **high degree** of accuracy.		

Assessment theme – Reports

Guidance for assessors

The following evidence from Tasks 2, 3 and 4 should be used to assess performance against this assessment theme.

Task 2

- Test and verification records.

Task 3 – for consideration only

- Candidate notes on the candidate feedback record form
- Peer review feedback form.

Task 4

- Evaluation and implementation report
- Revision control document
- Outcomes of virtual modelling.

Note: where there is insufficient evidence to award a mark, a zero mark must be given	Band 1 descriptor	Band 2 descriptor	Band 3 descriptor	Total marks per sub assessment theme	Total marks for assessment theme
	Indicative content: **Implementation** Completion of an evaluation and implementation report to include: • use of cable types, sensors and circuitry • wiring regulations BS7671 (IET) or relevant wireless connection regulations • any adaptations or modifications and improvements with justifications for any changes or not to virtual model design • revision control document with justifications • conformance to design requirements and functionality • commissioning procedures, siting of sensors and detectors				

	• justification for improvements. **Records/reports:** • completion of test records and reports/results, including function, performance testing, relevance and any limitations or challenges to methods used • descriptions of methods and processes • consideration of accuracy and sources of any errors • use of technical language and terminology.				
Marks per band	**1-4**	**5-8**	**9-12**	**12**	**18**
Implementation	Contains **some basic** information, **some minor** details missing that could impact on a third party familiar with the design being able to reproduce it.	Contains **good** information that would allow a third party that is familiar with the design to reproduce it.	Contains **detailed** information that would allow a third party to reproduce it.		
	Evaluation of the design is **basic** and identifies a **brief** list of improvements with **no justification.**	Evaluation of the design is **good** and identifies a **range** of improvements with **some justification**.	Evaluation of the design is **thorough** and identifies a **comprehensive range** of improvements with **clear and detailed justification**.		
	Where no improvements or adaptions are needed, this is supported with **brief** reasoning and justifications to why.	Where no improvements or adaptions are needed, this is supported with **good** reasoning and justifications to why.	Where no improvements or adaptions are needed, this is supported with **detailed and thorough** reasoning and justifications to why.		
	Changes or no changes to the design as a result of manufacturing, testing or feedback are **not always suitable** and **lack reasoning**.	Changes or no changes to the design as a result of manufacturing, testing or feedback are **suitable** with **some reasoning**.	Changes or no changes to the design as a result of manufacturing, testing or feedback are **suitable** with **detailed reasoning**.		
Marks per band	**1-2**	**3-4**	**5-6**	**6**	

Records/reports	Reports are **partially completed brief** in content with **some** incorrect technical and industry terminology.	Reports are **completed** in a **clear** format with only **minor** details missing. Content and technical and industry terminology is **mostly** accurate.	Reports are **detailed and accurate** with correct technical and industry terminology **throughout**.		
	Test records include **some** of the appropriate information.	Test records include **most** of the appropriate information.	Test records are **detailed** and include **all** appropriate information.		
	Some inaccuracies in recording of test outputs and measurements.	**Most** test outputs and measurements are accurate.	**All** test outputs and measurements are accurate.		

5. Links to Maths, English and Digital Skills

The table below indicates where each of the General Maths, English and Digital Competencies have been integrated into the assignment tasks.

Task	Skills
1	EC1, EC2, EC3, MC2, MC8, MC10, DC1, DC2
2	EC1, EC3, MC1, MC10
3	EC1, EC2, EC3, EC4, EC6, MC2
4	EC1, EC2, EC3, EC4, MC10, DC1, DC2