2016 Suite

OCR
Oxford Cambridge and RSA

Cambridge **TECHNICALS LEVEL 2**

Cambridge TECHNICALS 2016

ENGINEERING

Unit 4

Electrical, electronic engineering – operations and application

Model assignment

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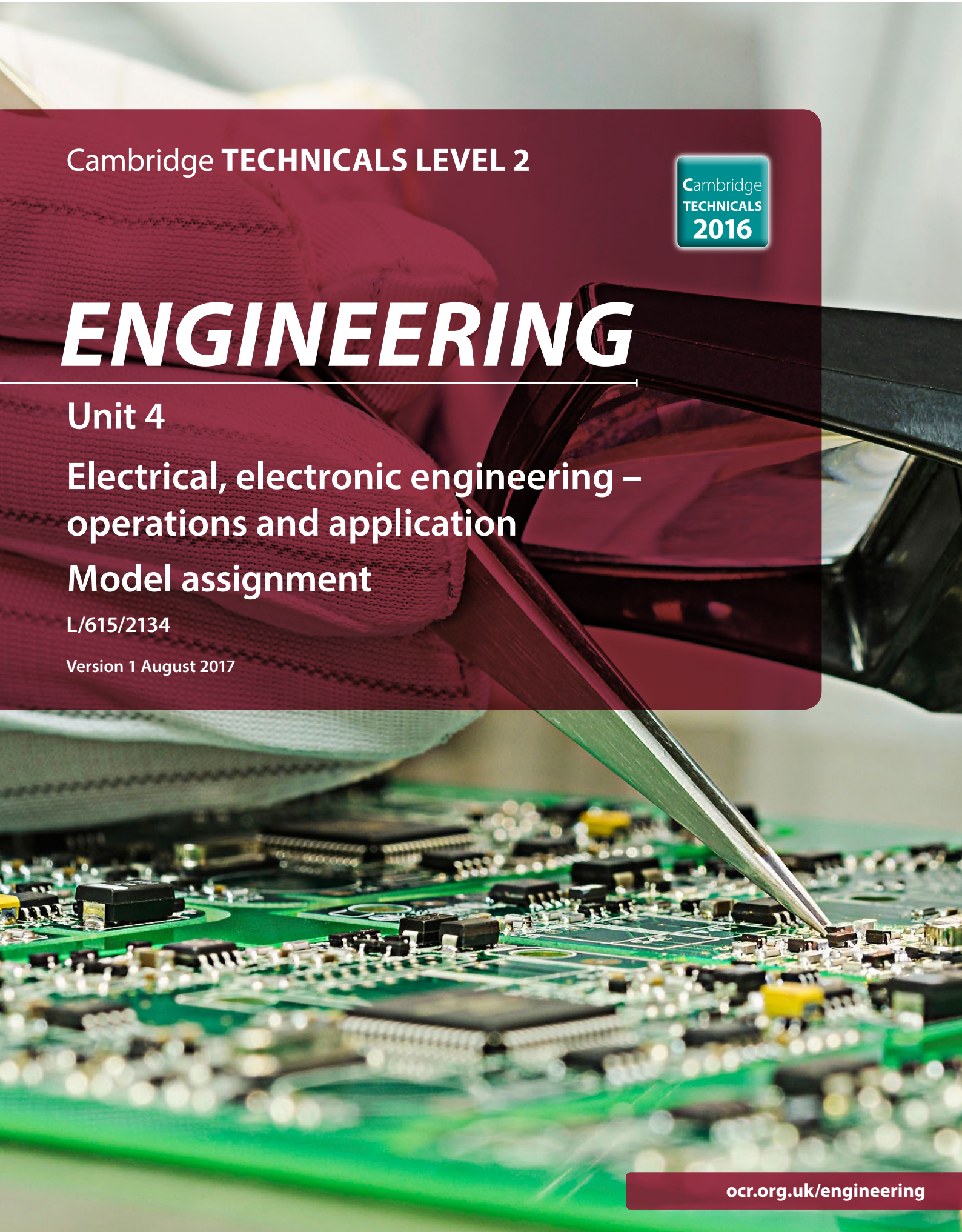

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Contents

Please note:

You can use this assignment to provide evidence for summative assessment, which is when the learner has completed their learning for this unit and is ready to be assessed against the grading criteria.

You can use this assignment as it is, or you can modify it or write your own; we give more information in this document under Guidance for tutors.

Guidance for tutors on using this assignment

General

OCR Cambridge Technical model assignments are available to download from our website: www.ocr.org.uk.

The purpose of this assignment is to provide a scenario and set of tasks that are typical of how electrical engineers build and test electronic circuits to enable you to assess your learner against the requirements specified in the grading criteria. The scenario and its tasks are intended to give a work-relevant reason for applying the skills, knowledge and understanding needed to achieve the unit.

This assignment will not instruct learners how to meet the highest grade. Whether learners achieve a pass, merit or distinction will depend on what evidence they produce.

You can modify the scenario we provide in this assignment to make it more relevant to your local or regional needs. Please refer to the information under 'Modifying the model assignment' later in this section.

You don't have to use this assignment. You can use it as a guide to help you to design your own assignment, and we provide an assignment checking service. You'll find more information on these matters in section 8 of the qualification handbook.

In the tasks, we'll refer to the format of evidence. Learners are **not** required to follow that format **unless** we tell them otherwise.

It's essential that the work every learner produces is their own. Please make sure you read through the information we give on authenticity in section 8 of the qualification handbook and make sure that your learners and any staff involved in assessment understand how important authenticity is.

We provide this assignment to be used for summative assessment. You must not use it for practice or for formative assessment.

Before using this assignment to carry out assessment

Learners will need to take part in a planned learning programme that covers the knowledge, understanding and skills of the unit.

When your learners are ready to be assessed, they must be provided with a copy of the following sections of this assignment:

- General information for learners
- Assignment for learners
- Evidence Checklist

They may carry out preparation prior to undertaking the tasks and there is no time limit for this.

When completing the assignment

You should use this assignment in conjunction with the unit specification and qualification handbook.

Resources to complete the tasks

There are resource requirements for this assignment. Every learner will need access to the following resources:

- Health and Safety regulations, standards and codes of practice for carrying out electrical operations.
- Appropriate personal protective equipment (PPE), tools and electrical and electronic components to be able to safely construct a circuit.
- Component and circuit data and appropriate test equipment to be able to test their circuit.

Tutor information to support the tasks

You may want to give a general introduction to the function of the temperature monitoring device presented in the scenario.

Observation and witness statements can be a useful way of providing support and corroboration of learner-generated evidence and skills which are not easily represented in the portfolio of evidence (see the section on Internal Assessment in the Qualification handbook, and in particular the section on the use of witness statements).

In task 1, consideration of health and safety regulations, standards and codes of practice should recognise that the final design will be mains powered. You could provide learners with blank risk assessment and safe work method statement such as those available from the Health and Safety Executive (HSE) website but learners must write their own individual responses in any provided pro-forma.

In task 2 learners need to demonstrate a range of construction techniques. See unit specification content 2.5 and 2.6.

For task 3 you will need to supply data sheets for circuit components so that learners can perform functionality tests on their circuit (learners need to compare measured values with those expected from data). Fault rectification may not be required if a learner's circuit works correctly first time however circuit functionality checks and testing could be achieved by calibrating the temperature range of the circuit using variable resistors VR1 and VR2.

For D1, to meet this criteria learners must evaluate **both** the quality of circuit construction (task 2) and circuit functionality (task 3).

Health and Safety and the use of resources

Health and safety will need to be considered should any of the tasks, or parts of the tasks be undertaken as practical activities. This should include appropriate risk assessments, safe working methods statements and the use of appropriate personal protective equipment (PPE).

Time

You should plan for learners to have 14–19 hours to complete this assignment.

Learners must be allowed sufficient time to complete all the tasks. The amount of time may vary depending on the nature of the tasks and the ability of individual learners. To help with your planning, against each of the tasks we've given an indication of how long it should take.

Learners can produce evidence in several sessions.

Format of evidence

Learners have to produce evidence that demonstrates how they have met the grading criteria. At the very least they must produce evidence that meets **all** of the pass criteria.

Please make sure your learners realise that missing just one pass criterion means they will not pass the unit, even if they have successfully met the merit and distinction criteria.

We don't have specific requirements for the format of evidence in this assignment. We've said what format the evidence could take for each task. For example, if we say 'You could include a report on …', the evidence doesn't have to follow any specific reporting conventions. You can modify the format of the evidence, but you must make sure the format doesn't prevent the learner from accessing the grading criteria.

It's possible that certain formats for evidence can naturally cover several grading criteria and avoid the need for excessive amounts of evidence. For example, a report can be a good way to pull together evidence to meet several grading criteria.

For more guidance on generation and collection of evidence, please refer to the section 8 'Internal Assessment', in the qualification handbook.

Group work

This assignment hasn't been written to include group work. If you plan to ask learners to work in a team to complete work for assessment, you need to determine at which point in an assessment task learners can work together.

You must be sure that each learner can produce evidence of their own contribution to each grading criterion. You can give constructive feedback to learners about working as a group and direct them on team working skills because evidence of team working skills is not required by the unit. See our information on authentication, including group work and feedback to learners, in section 8 of the qualification handbook.

If witness statements are used to support learners' evidence, you'll need to complete an individual statement for each learner.

After completing the assignment

Once the learner has submitted their work to you to be assessed, you must judge or 'mark' the work against the grading criteria for the unit and identify one grade for the unit. For further information about assessment, please refer to section 8 of the qualification handbook.

Your assessment decisions must be quality assured across the cohort of learners in your centre who are being entered for the same unit. This must be done through an internal standardisation process. We give information on internal assessment and standardisation in the qualification handbook.

Reworking the assignment

If you and the learner feel they've not performed at their best during the assessment, the learner can, at your discretion, improve their work and resubmit it to you for assessment. If a learner is working on improving their work before it is resubmitted, you and the learner must continue to make sure the work is the learner's own.

Any feedback you give to the learner must not direct them on how to improve their work. You can identify what area of the work could be improved but you cannot give the learner any details about how they could improve it. You must follow the guidelines given in section 8 of the qualification handbook under 'Authenticity of learner work'.

Modifying the model assignment

The tasks in this assignment allow learners access to the full range of grades detailed in the grading criteria of this unit.

If you modify this assignment you must **not** change the grading criteria provided in the tasks for the learner or in the evidence checklist. These grading criteria are taken from the unit.

You can modify the scenario to suit your local or regional needs and the tasks may be contextualised to match any changes you have made to the scenario. If you supply your own drawings to support a different scenario, these must be sufficiently detailed for learners to complete the tasks.

You can modify the type of evidence and the format it takes, unless we expressly state that evidence must take a specific format.

You must also make sure that you avoid discrimination, bias and stereotyping and support equality and diversity. For more information, please see the section 'Designing your own assignments for internally assessed units' in section 8 of the qualification handbook.

If modifications are made to the model assignment, whether to the scenario alone, or to both the scenario and individual tasks, it's your responsibility to make sure that all grading criteria can still be met and that learners can access the full range of grades.

If you're using this model assignment and delivering the Diploma you have an opportunity to secure meaningful employer involvement by working with an employer to modify it.

General information for learners

Q ***What do I need to do to pass this assignment?***

A You need to produce evidence to meet the requirements of **all** the pass criteria for the unit this assignment relates to. If you miss just one pass criterion, you will not achieve this unit and will receive an unclassified result.

Q ***What do I need to do if I want to get a merit or distinction for this assignment?***

A For a merit, you need to produce evidence to meet the requirements of **all** the pass criteria for the unit this assignment relates to **and** you need to produce evidence to meet **all** the merit criteria.

For a distinction, in addition to the above, you also need to meet **all** the distinction criteria for this unit.

Q ***What help will I get?***

A Your tutor will support you when completing this assignment and will make sure that you know what resources or facilities you need and are allowed to use. We've given your tutor information about how much support they can give you.

Q ***What if I don't understand something?***

A It's your responsibility to read the assignment carefully and make sure you understand what you need to do and what you should hand in. If you are not sure, check with your tutor.

Q ***I've been told I must not plagiarise. What does this mean?***

A Plagiarism is when you take someone else's work and pass this off as your own, or if you fail to acknowledge sources properly. This includes information taken from the internet.

It's not just about presenting a whole copied assignment as your own; you will also be plagiarising if you use the ideas or words of others without acknowledgement, and this is why it's important to reference your work correctly (see Q&A below for more information on referencing).

Plagiarism has serious consequences; you could lose the grade for this unit or you may not be allowed to achieve the whole qualification.

Always remember that the work you produce must be your own work. You will be asked to sign a declaration to say that it is.

Q ***What is referencing and where can I find out more information about it?***

A Referencing is the process of acknowledging the work of others. If you use someone else's words and ideas in your assignment, you must acknowledge it, and this is done through referencing.

You should think about why you want to use and reference other people's work. If you need to show your own knowledge or understanding about an aspect of subject content in your assignment, then just quoting and referencing someone else's work will not show that **you** know or understand it. Make sure it's clear in your work how you are using the material you have referenced **to inform** your thoughts, ideas or conclusions.

You can find more information about how to reference in *The OCR Guide to Referencing* available on our website: http://www.ocr.org.uk/Images/168840-the-ocr-guide-to-referencing.

Q ***Can I work in a group?***

A Yes. However, if you work in a group at any stage, you must still produce work that shows your individual contribution. Your tutor can advise you how to do this.

Q ***Does my work for each task need to be in a particular format?***

A You can present your work in a variety of ways – it can be handwritten, word-processed, on video or in digital media. What you choose should be appropriate to the task(s) and your tutor can advise you. There may be times when you need proof that you have completed the work yourself: for example, if you do something during work placement that you want to use as evidence, the tutor might ask the employer to provide a witness statement.

Make sure you check the wording in each task carefully. For each task, we'll tell you if your evidence has to be in a specific format:

- If we say use the word '**must**', for example 'You must produce a report' or 'Your evidence/work must include a diagram', then you must produce the work in the stated format.
- If we use the word '**could**', for example 'You could include sketches of your ideas' or 'You could do this by annotating your diagram', this means that you are not required to follow the format we have given, but you must make sure that the work you do produce allows you to demonstrate the requirements of the grading criteria.

If you are unsure about what evidence you need, please ask your tutor.

Q ***Can I ask my tutor for feedback on my work?***

A Yes, but they can't give you detailed feedback.

We have given your tutor instructions on what kind of feedback they can give you. For example, they are **not** allowed to tell you exactly what to do to make your work better, but they **can** remind you about what they've taught you and you can use this additional learning to try and improve your work independently. They can say what they've noticed might be wrong with your work, for example if your work is descriptive where an evaluation is required, but your tutor can't tell you specifically what you need to do to change it from a description to an evaluation – you will need to work out what you need to do and then do it for yourself.

Q ***When I have finished, what do I need to do?***

A If you have included the personal details (such as name, address or date of birth) of someone other than yourself in your work, this must be blanked out (anonymised) – your tutor will tell you how to do this. You don't need to do this for information contained in references.

You can complete the evidence checklist to show your tutor where they can find the evidence for each grading criterion in your work.

You should make sure your work is labelled, titled and in the correct order for assessing.

Hand in the work that you've completed for each task to your tutor. They might ask to see your draft work, so please keep your draft work in a safe place.

Q ***How will my work be assessed?***

A Your work will be marked by someone in your centre who has been authorised to do so. They will use the information in the grading criteria to decide which grade your work meets. The grading criteria are detailed in each unit and are also given in the tasks within this assignment. Please ask your tutor if you are unsure what the grading criteria are for this assignment.

Assignment for learners
Unit 4: Electrical, electronic engineering – operations and application

Scenario

Fig. 1

Precision cutting tools, like the one shown in **Fig. 1**, use cutting fluids to maintain a working cutting temperature to ensure that the tool is not damaged by excessive heat.

The temperature of the cutting fluid in the reservoir tank must be monitoried to make sure that it is kept at the correct working temperature.

The cutting fluid temperature is to be monitored by an electronic circuit shown in **Fig. 2**.

The temperature sensing device is to be connected to an electrical circuit by a three core cable. The visual display is by a series of light-emitting diodes (LEDs) and the circuit for the purpose of creating a prototype is to be battery powered. The final design however will be powered by a mains supply through a transformer.

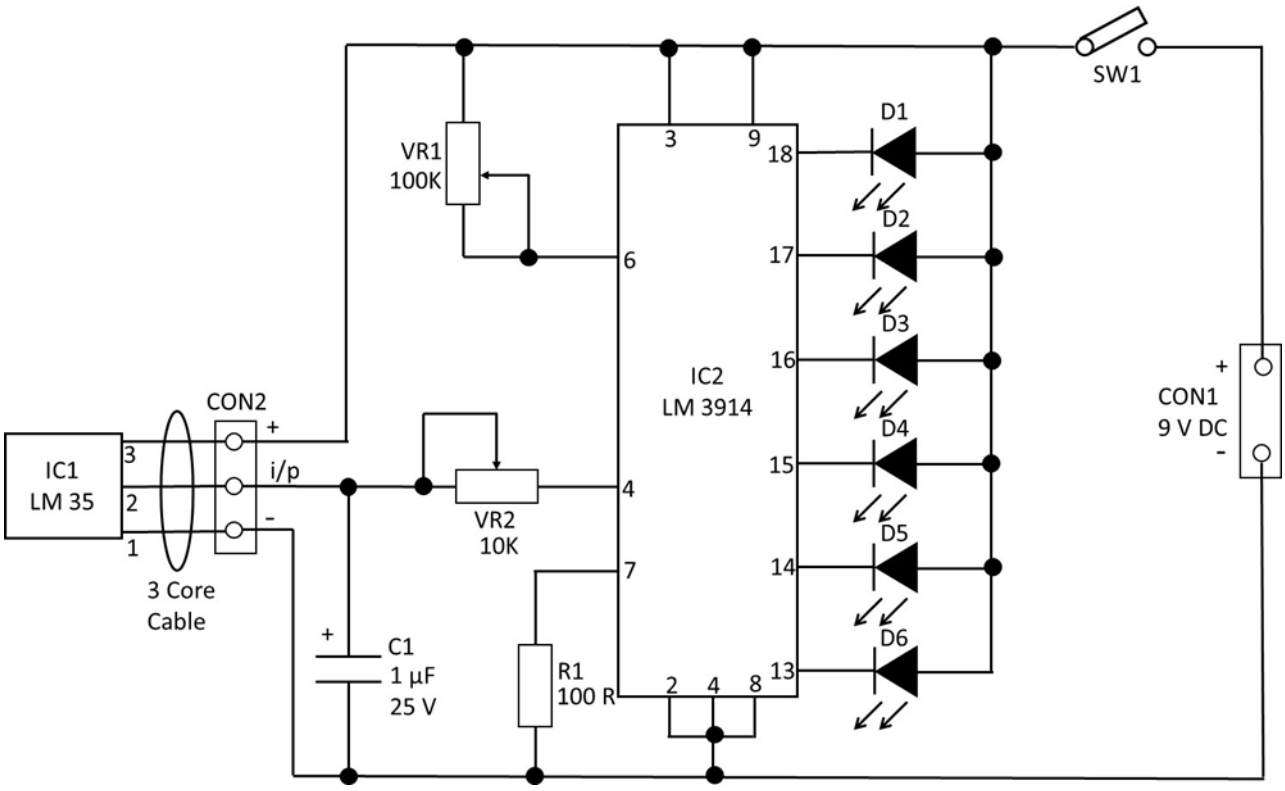

Fig. 2 Temperature monitor circuit

Component List

R1	100 R	D1, D2	Green LED
VR1	100 K	D3	Yellow LED
VR2	10 K	D4, D5, D6	Red LED
C1	1 µF 25 V	CON 1	2 pin connector
IC1	LM 35 Temperature Sensor	CON 2	3 pin connector
IC2	LM3914 Dot/Bar Display Driver	SW 1	N/O switch

Task 1: Plan for safe circuit construction/testing

(This task should take between 3 and 4 hours.)

Learning Outcome 1: 'Be able to work safely when undertaking electrical operations' and P3 of **Learning Outcome 2**: 'Be able to construct electronic circuits by interpreting circuit diagrams' are assessed in this task.

Your first task is to interpret the circuit diagram to plan for the construction of the temperature monitor circuit. The temperature sensor is to be mounted in the cutting fluid reservoir and connected to the temperature monitor circuit through a three-core cable. You should also consider as part of your interpretation how the temperature sensor can be easily disconnected from the temperature monitor circuit.

Your second task is to investigate and describe the relevant aspects of Health and Safety.

Your investigation will include:

- regulations, standards and codes of practice appropriate to carrying out electrical operations for constructing and testing the temperature monitor circuit.
- aspects of safe working practices of circuit construction and mains power supply for the final design

Your final task is to produce a risk assessment to include a safe working method statement for the construction and testing of the temperature monitor.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td>P1: Describe the relevant aspects of Health and Safety regulations, standards and codes of practice to carry out electrical operations.</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>P2: Carry out a risk assessment when performing electrical operations to include a safe working method statement.</td></tr>
<tr><td>P3: Interpret a circuit diagram to plan for construction of an electronic circuit.</td></tr>
<tr><td colspan="3">Evidence</td></tr>
<tr><td colspan="3">You must produce a detailed written plan for the construction of the circuit.
You must produce a description of the relevant aspects of Health and Safety regulations, standards and codes of practice to carry out electrical operations. This could be presented as a report or a presentation with detailed speaker notes.
You must produce a written risk assessment along with a safe work method statement for the construction and testing of the circuit.</td></tr>
</table>

Task 2: Constructing the circuit

(This task should take between 7 and 10 hours.)

Learning Outcome 2: 'Be able to construct electronic circuits by interpreting circuit diagrams' is assessed in this task. NB: LO2: P3 is assessed in task 1.

Your task is to construct the temperature monitor circuit using the circuit diagram in Fig. 2 and your plan from task 1. You must use appropriate component assembly and construction techniques whilst safely using tools to construct the circuit.

You could explain the techniques you have used to construct the temperature monitor circuit and evaluate the quality of the final circuit.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td>P4: Safely use tools to construct a circuit.</td><td rowspan="2">M1: Explain construction techniques used to construct electronic circuits.</td><td rowspan="2">D1: Evaluate the quality of circuit construction (and circuit functionality)*
*see task 3</td></tr>
<tr><td>P5: Construct a circuit from a circuit diagram using appropriate component assembly and construction techniques.</td></tr>
<tr><td colspan="3">Evidence</td></tr>
<tr><td colspan="3">You must produce evidence to show the safe use of tools, component assembly and construction techniques. This could be in the form of annotated photographic evidence supported by witness statement(s) from your tutor.
Evidence of construction could be in the form of annotated photographs showing key stages and your completed circuit.
You could produce a written report or a presentation with detailed speaker notes to explain the techniques used to construct the circuit along with an evaluation of the quality of the final circuit construction.</td></tr>
</table>

Task 3: Testing the circuit

(This task should take between 4 and 5 hours.)

Learning Outcome 3: 'Be able to test electronic circuits for functionality' is assessed in this task.

Your tutor will supply you with appropriate data for circuit component tests.

Your first task is to use component and circuit data along with appropriate test equipment to perform functionality checks (rectifying any faults found) on the temperature monitor circuit.

Your second task is to explain the test procedures you used to establish functionality and/or rectification of faults found in the temperature monitor circuit and evaluate the functionality of the final circuit.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td>P6: Use data to perform functionality checks on electronic circuit(s).</td><td rowspan="2">M2: Explain test procedures used to establish functionality and/or rectification of faults found in an electronic circuit.</td><td rowspan="2">D1: Evaluate the (quality of circuit construction and)* circuit functionality.
*see task 2</td></tr>
<tr><td>P7: Use appropriate test equipment and follow procedures to confirm electronic circuit functionality, rectifying any faults found.</td></tr>
<tr><td colspan="3">Evidence</td></tr>
<tr><td colspan="3">You must show how you have used data and appropriate test equipment to test the functionality of the circuit, including the rectification of any faults found. This could be in the form of annotated photographic evidence of testing taking place, along with the recording and comparison of measurements taken against expected electrical values.
You must include evidence of your fully functioning circuit which could be through annotated photographs supported by a witness statement from your tutor.
You could produce written report or presentation with detailed speaker notes to explain the test and rectification procedures used along with an evaluation of the circuit functionality.</td></tr>
</table>

Evidence Checklist

OCR Level 2 Cambridge Technicals in Engineering Unit 4: Electrical, electronic engineering – operations and application

LEARNER NAME:

For Pass have you: **(as a minimum you have to show you can meet every pass criterion to complete the unit)**	**Where can your tutor find the evidence? Give page no(s)/digital timings, etc.**
P1: Described the relevant aspects of Health and Safety regulations, standards and codes of practice to carry out electrical operations?	
P2: Carried out a risk assessment when performing electrical operations to include a safe working method statement?	
P3: Interpreted a circuit diagram to plan for construction of an electronic circuit?	
P4: Safely used tools to construct a circuit?	
P5: Constructed a circuit from a circuit diagram using appropriate component assembly and construction techniques?	
P6: Used data to perform functionality checks on electronic circuit(s)?	
P7: Used appropriate test equipment and followed procedures to confirm electronic circuit functionality, rectifying any faults found?	

For Merit have you:	**Where can your tutor find the evidence? Give page no(s)/digital timings, etc.**
M1: Explained construction techniques used to construct electronic circuits?	
M2: Explained test procedures used to establish functionality and/or rectification of faults found in an electronic circuit?	

For Distinction have you:	**Where can your tutor find the evidence? Give page no(s)/digital timings, etc.**
D1: Evaluated the quality of circuit construction and circuit functionality?	

To find out more
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or call our Customer Contact Centre on **02476 851509**

Alternatively, you can email us on **vocational.qualifications@ocr.org.uk**

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