

Cambridge **TECHNICALS LEVEL 3**

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ENGINEERING

Unit 13

Mechanical operations

Model assignment

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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.

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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 mechanical operations are used in the engineering environment 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.

Please note – if learners are completing this model assignment as part of the Extended Diploma qualification they will be required to complete the synoptic unit 25: Promoting continuous improvement. Before your learners complete this model assignment, you must refer to the specification and model assignment requirements for unit 25, so if applicable you can ensure learners gather the appropriate feedback on their own performance and performance of the system, process or artefact that they will produce in this model assignment.

Resources to complete the tasks

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

- A workshop with a range of hand tools for marking out, cutting, forming and measuring equipment – see Unit Specification LO2 and LO5.
- A centre lathe, bench/pillar drill and milling machine – see Unit Specification LO3 and LO4.
- Health and Safety equipment appropriate to the manufacturing processes undertaken.
- The raw materials and sundries required to produce the manufactured parts.

Information to support the scenario/tasks

The scenario in this assignment details an example of a push rod tube assembly that could be manufactured by your learners. An engineering drawing for this assembly is included in the appendix; you should provide this to your learners if you choose to use this part. Alternatively, you can develop your own engineering drawings for different parts to suit your centre resources or employer partners. In either case, you must ensure that the drawings are sufficiently detailed to allow learners to demonstrate the full requirements of the unit.

It is envisaged that a number of parts will need to be manufactured in order to fulfil the tasks in this assignment. This means some parts may not relate to other parts directly. Fastenings can be bespoke or standard components.

In task 1, if you provide your own engineering drawings, they must comply with standard engineering drawing conventions. In LO5 learners will need to use measuring equipment including a vernier caliper and micrometer, therefore tolerances in the engineering drawings must include at least one tolerance to accommodate this requirement. Learners could use a standard template for risk assessments, production planning or a safe working method statement; these could be written or electronic. You may use templates from the HSE website or ones provided by employer partners.

In task 2, if you are using the engineering drawing of the push rod tubes you **must** ensure the following points:

For P8 'Use a range of temporary fastenings' learners should consider how the push rod assembly could be connected to the bike frame using different forms of temporary fastenings, see Unit Specification 2.2. The scenario shows one possible method but learners should consider a range.

For M3 'Cut groves, knurls and drills using the tailstock' learners could consider how the push rod assembly remains fixed in position when assembled to the bike frame using methods, such as groves and knurls, which have not been specified on the supplied drawing.

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). Learners should be encouraged to take part in assessing risk before conducting any practical activity.

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.

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 learner 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 Foundation Diploma, Diploma or Extended 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 13: Mechanical operations

Scenario

OCR Classic Parts

OCR Classic Parts is a company that make and supply parts for the classic car and motorcycle community. Most classic vehicles are over 40 years old and getting good reproduction or copied parts is difficult. Modern equipment and new materials now enable small machine shops, such as OCR Classic Parts, to make one-off or short production runs of high quality accurately manufactured parts.



Fig. 1



Fig. 2

Fig. 1 shows an example of a push rod tube for a classic motorcycle and Fig. 2 shows an example of how the push rod tube assembly can be connected to the motorcycle frame using temporary fastenings.

When manufacturing the push rod tube assembly the engineering machinist will use bench work, marking out, drilling and threading as well as performing turning, milling and threading operations.

As an overview, in this assignment you will manufacture parts from engineering drawings supplied by your tutor by:

- Creating a production plan and safe work method statement
- Using bench tools, processes and equipment
- Using a centre lathe
- Using drilling and milling machines
- Quality assuring parts using measuring equipment and quality control checks.

Task 1: Preparing for the production of parts

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

Learning Outcome 1: Be able to plan for production in mechanical engineering' and P7 of

Learning Outcome 2: Be able to use bench processes, tools and equipment to produce quality components' are assessed in this task.

Your first task is to create a production plan for the safe manufacture of parts through the interpretation of their engineering drawings (which your tutor will supply). Your production plan must consider safe working practices such as risk assessments, use of PPE and the disposal of waste. You should also state in your production plan what quality control checks you will apply with reference to the engineering drawings of the manufactured parts.

Your second task is to produce a Standard Operating Procedure for assembly of your parts.

Your third task is to produce a safe work method statement for the operations identified in your production plan.

Pass	Merit	Distinction
P1: Safely prepare for working procedures in mechanical operations.	M1: Create a safe work method statement.	
P2: Interpret engineering drawings for manufacture.		
P3: Create a production plan.		
P7: Produce a Standard Operating Procedure for assembly		
Evidence		
Your evidence should be the production plan, annotated engineering drawings, Safe Operating Procedure for assembly and safe work method statements.		

Task 2: Use hand and machining processes to manufacture parts

(This task should take between 9 and 12 hours.)

Learning Outcome 2: Be able to use bench processes, tools and equipment to produce quality components', **Learning Outcome 3:** Be able to use the centre lathe to produce quality components' and **Learning Outcome 4:** Be able to use drilling and milling machines to produce quality components' are assessed in this task. [refer to Task 1 for P7 of Learning Outcome 2]

Your task is to produce parts from the drawings supplied by your Tutor following your production plan and following safe working procedures.

Through the manufacture of parts, you will need to demonstrate the safe use of:

- Bench processes, tools and equipment
- Centre lathe
- Drilling machine
- Milling machine.

Whilst manufacturing the parts you must demonstrate the correct and safe use of:

- a range of marking tools and equipment such as surface plates, scribe, callipers, engineer's square and engineer's blue.
- a range of hand tools and equipment such as hacksaws, files, work holding devices and drills.
- taps and dies to produce threaded features.
- a centre lathe for turned parts using face, parallel and taper turn operations, including the calculation of correct feed and speed for the work piece.
- a milling machine including the calculation of correct feed and speed for cutter.
- a bench/pillar drill.
- a range of correct assembly procedures for temporary fastenings such as nuts, bolts/machine(set) screws and self-tapping screws.

Whilst manufacturing the parts you could also demonstrate:

- Using the centre lathe to:
 - Manufacture turned parts within the specified tolerance of the engineering drawing.
 - Cut grooves, knurls and drills using the tailstock.
 - Cut an external screw thread or internal bore so that the components have a good running fit.
- Using the milling machine to:
 - Manufacture milled and drilled parts within the specified tolerance of the engineering drawing.
 - Use pitch circles accurately.
 - Use a dividing head effectively and accurately.

Pass	Merit	Distinction
P4: Use marking tools and equipment safely and effectively		
P5: Use a range of hand tools safely and effectively		
P6: Produce threads using taps and dies		
P8: Use a range of temporary fastenings		
P9: Use the centre lathe safely		D1: Cut an external screw thread or internal bore so that the components have a good running fit.
P10: Manufacture turned parts using face, parallel and taper turn operations.	M2: Manufacture turned parts within a specified tolerance.	
P11: Calculate correct feed and speed for work piece. *synoptic link to Unit 1 Mathematics for Engineering	M3: Cut grooves, knurls and drills using the tailstock.	
P12: Use the milling machine safely.	M4: Manufacture milled and drilled parts within a specified tolerance.	D2: Use a dividing head effectively and accurately.
P13: Manufacture milled parts using correct feed and speed for cutter	M5: Use pitch circles accurately.	
P14: Use the bench/pillar drill correctly and safely.		
Evidence		
<p>A portfolio that could include a logbook and must include annotated photographs showing correct and safe manufacture and assembly of parts supported by witness statements from your Tutor. The witness statement must confirm that you have followed safe working practices for each operation. You must include calculations of speeds and feeds.</p> <p>You could include annotated drawings stating the actual dimensions to confirm that your parts meet specified tolerances.</p>		

Task 3: Quality assurance of the manufactured parts

(This task should take between 2 and 3 hours.)

Learning Outcome 5: 'Be able to quality assure components' is assessed in this task.

Your task is to quality assure the parts you have manufactured using a range of appropriate measuring equipment and planned quality control checks determined in your production plan and by the engineering drawing.

Using the results of your quality control checks, review and report on how you could make adaptations to working practices to improve for example, accuracy, quality and production time.

Pass	Merit	Distinction
P15: Make effective use of appropriate measuring equipment.	M6: Adapt working practice in light of quality control results.	
P16: Apply quality control checks in the manufacturing process.		
Evidence		
You could include a portfolio of annotated photographs showing the use of appropriate measuring equipment for each quality check and a written report or presentation of your quality control check results, including the annotated engineering drawing of your parts. You could include a written report or presentation detailing the adaptations to working practices based on your quality control check results.		

Evidence Checklist

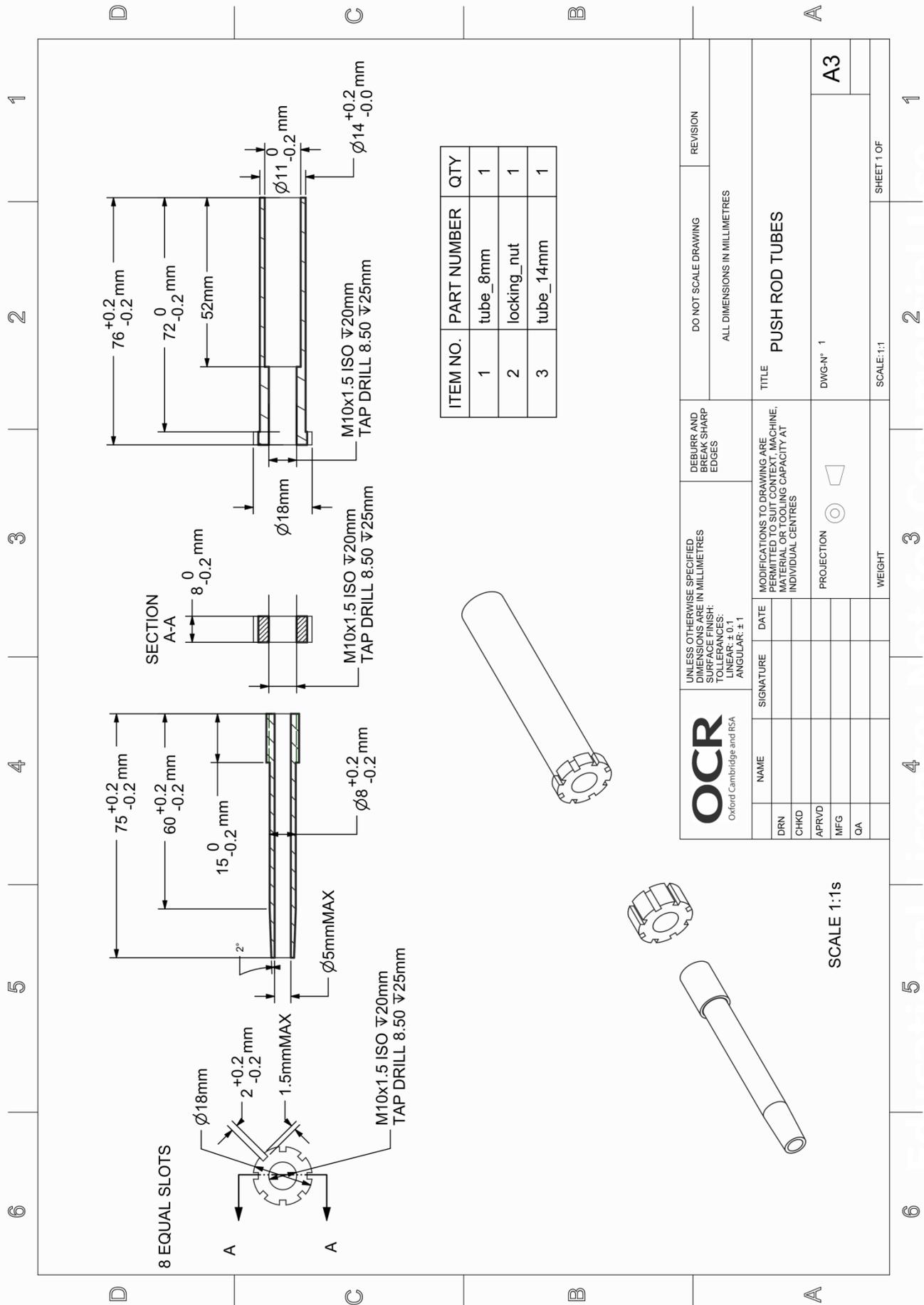
OCR Level 3 Cambridge Technicals in Engineering Unit 13: Mechanical operations

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.
Safely prepared for working procedures in mechanical operations. (P1)	
Interpreted engineering drawings for manufacture. (P2)	
Created a production plan. (P3)	
Used marking tools and equipment safely and effectively. (P4)	
Used a range of hand tools safely and effectively. (P5)	
Produced threads using taps and dies. (P6)	
Produced a Standard Operating Procedure for assembly. (P7)	
Used a range of temporary fastenings. (P8)	
Used the centre lathe safely. (P9)	
Manufactured turned parts using face, parallel and taper turn operations. (P10)	
Calculated correct feed and speed for work piece. (P11)	
Used the milling machine safely. (P12)	
Manufactured milled parts using correct feed and speed for cutter. (P13)	
Used the bench/pillar drill correctly and safely. (P14)	
Made effective use of appropriate measuring equipment. (P15)	
Applied quality control checks in the manufacturing process (P16)	

For Merit have you:	Where can your tutor find the evidence? Give page no(s)/digital timings, etc.
Created a safe work method statement. (M1)	
Manufactured turned parts within a specified tolerance. (M2)	
Cut grooves, knurls and drills using the tailstock. (M3)	
Manufactured milled and drilled parts within a specified tolerance. (M4)	
Used pitch circles accurately. (M5)	
Adapted working practice in light of quality control results. (M6)	

For Distinction have you:	Where can your tutor find the evidence? Give page no(s)/digital timings, etc.
Cut an external screw thread or internal bore so that the components have a good running fit. (D1)	
Used a dividing head effectively and accurately. (D2)	



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