

T Level Technical Qualification in Engineering, Manufacturing, Processing and Control (8730-13)

**8730-034 Employer-Set Project
Exemplar – E Grade
Summer 2025**

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Introduction

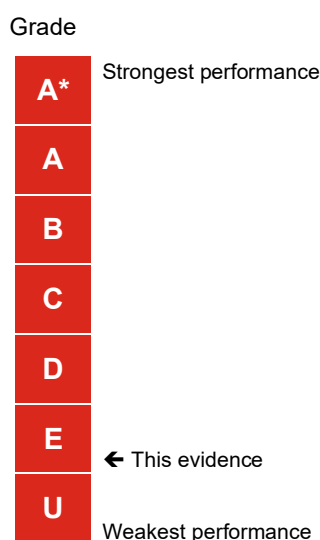
Summer 2025 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2025 assessment series to achieve an E grade for the 8730-034 Engineering, Manufacturing, Processing and Control Employer-Set Project (ESP).

Providers and learners may wish to use it to benchmark the performance in formative assessment against this to help understand a potential grade that may be achieved if a learner was to attempt the next summative assessment series.

The Employer-Set Project is graded A* to E and Unclassified.

The exemplar evidence provided for the E grade displays the holistic standard required across the tasks to achieve **one mark above** the E grade boundary for the summer 2025 series. A slightly weaker performance would have resulted in an Unclassified (U) result being issued.



The Employer-Set Project brief and tasks can be downloaded from [here](#).

Important things to note:

- We discussed the approach to standard setting/maintaining with Ofqual and the other awarding organisations before awarding this year. As in 2024, we have agreed to take account of the newness of T Level qualifications in how we award, to recognise that students and teachers are less familiar with the assessments in the first years of awards, whilst also recognising the standards required for these qualifications (<https://www.gov.uk/government/publications/ofqual-guide-for-schools-and-colleges-2025/ofqual-guide-for-schools-and-colleges-2025#grading>). Ofqual guide for schools and colleges 2025
- The exemplar evidence presented, as a whole, was sufficient to achieve the E grade. However, performance across the tasks may vary (i.e. some tasks completed to a higher/lower standard than an E grade).

Marking of this Employer-Set Project is by task and Assessment Objective, below is a summary of these along with the mark achieved by the evidence presented and the maximum mark available for each aspect.

Task	Assessment Objectives	Mark achieved	Max mark available
Task 1 Research	- AO1 Plan their approach to meeting the project brief - AO2a Apply core knowledge - AO3 Select relevant techniques and resources to meet the brief	3	9
	- AO2b Application of core skills	3	6
Task 2 Report	- AO1 Plan their approach to meeting the project brief - AO3 Select relevant techniques and resources to meet the brief	2	6
	- AO2a Apply core knowledge	3	6
	- AO2b Application of core skills	2	6
Task 3 Design	- AO1 Plan their approach to meeting the project brief - AO3 Select relevant techniques and resources to meet the brief	2	6
	- AO2a Apply core knowledge	1	6
	- AO2b Application of core skills	2	6
	- AO5a Realise a project outcome – was the right outcome achieved - AO5b Review how well the outcome meets the brief, how well the brief was met, the quality of the outcome in relation to the brief	1	6
Task 4 Present	- AO1 Plan their approach to meeting the project brief - AO3 Select relevant techniques and resources to meet the brief	2	6

	- AO2a Apply core knowledge	3	6
	- AO2b Application of core skills	2	6
	- AO5a Realise a project outcome – was the right outcome achieved - AO5b Review how well the outcome meets the brief, how well the brief was met, the quality of the outcome in relation to the brief	3	6
Maths	- AO4a Use of Maths skills	1	3
English	- AO4b Use of English skills	1	3
Digital skills	- AO4c Use of Digital skills	1	3

What evidence was being assessed for the Maths, English and Digital skills:

Maths:

- Research notes – maximum load supported by the gripper (Task 1)
- Report – any calculations relating to load supported by the gripper, his method of powering and the reason for selection (Task 2)
- Relevant design calculations related to annotated drawing - calculations of max load supported by gripper and forces required for the gripping mechanism (Task 3)

English:

- Research notes (Task 1)
- Report (Task 2)
- Reflective notes (Task 3)
- Video of presentation and materials to support presentation (e.g. slides etc) (Task 4)

Digital:

- Types of sources used for Research (Task 1)
- Report (Task 2)
- Drawings (Task 3)
- Presentation materials (slides, handouts, notes etc) (Task 4)

Task 1 Research

Assessment number (eg 1234-033)	8730-034
Assessment title	Employer-Set Project

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	1
Evidence title / description	Evidence expected for marking: Research notes (typically 1500 words) List of references/sources Evidence submitted for marking: Research notes (typically 1500 words) List of references/sources
Date submitted by candidate	DD/MM/YY

Research task

Appropriate materials for the gripper

Refractory metals such as molybdenum (2,623 degrees Celsius resistant to heat), tantalum (3,017 degrees Celsius resistant to heat) and advanced ceramics such as silicon carbide and heat resistant stainless steel. Metals that can hold heavy loads are steel, titanium, tungsten, Inconel.

Steel is suitable because it can withstand high heats and heavy loads making it suitable for this job. The properties of steel are as listed: hardness, toughness, tensile strength, durability, thermal conductivity and resistivity, malleability. Which means this can be a suitable material for this job. Steel can withstand up to 870 degrees Celsius and this is more than enough because the bar will be heated up to 600 degrees Celsius.

Suitable mechanisms for the gripper

The types of mechanisms available are: manual which are actuated by a hand crank, wheel, levers this won't be suitable because the bar needs to be stable and needs to be safe for the user using the gripper and this will waste time because the bar will be very hot and heavy and due to caution the user will be moving the levers and cranks slow. Electric grippers or jaws are actuated by an electric motor, solenoid this won't be suitable because not all motors can withstand high temperatures and won't be as effective also, not all workers will know how to use the electric motors as they might not be as

technically advanced as some people. So, this won't be the best option as only a limited amount of people will know how to use it and the company would rather save money on teaching them on how to use it. Pneumatic grippers are actuated by compressed air acting on a cylinder or vanes. This can be an option as some pneumatic grippers can withstand 1000 degrees Celsius. However, the downside would be to constantly check pressure levels and making sure the grippers are not overworked and that it's safe to use because you don't want a pressure build up and the gripper to malfunction. Hydraulic grippers are actuated by hydraulic fluid acting on a cylinder or vanes.

Advantages of hydraulic grippers

This is the best option because it lifts heavy loads which makes it safer for manpower because man can get hurt lifting heavy loads constantly whereas the gripper is an arm pressured by hydraulic.

Having a hydraulic gripper reduces the risk of Musculoskeletal injury due to repetitive strain injury.

Avoids employer fatigue.

Improves the efficiency of the production line.

Excellent gripping power.

bulky as they take up space in the working area

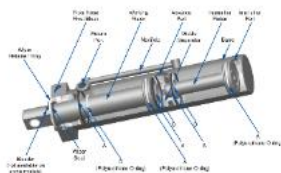
prone to fluid leaks due to wear and tear and the lack of maintenance, also mechanical stress.

motor driven- have an electric motor which will pressurize hydraulic fluids to the actual gripper.

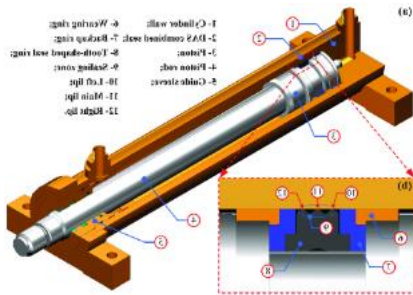
Hydraulic power unit (HPU)- consists of a pump, motor and a reservoir to supply power to the hydraulic gripper.

Parts of a hydraulic gripper

Cylinder



Piston



Manufacture methods for the gripper parts

The piston will most likely be made out of steel and be transformed into the shape by the process of a CNC machine for accurate dimensions and sizing. Then the piston will be surface treated to resist corrosion and wear using graphite lube. Then add O rings to seal it up and prevent leakage.

The cylinder will be made out of steel and be transformed into the shape by the process of a CNC machine for accurate dimensions and sizing. Then the piston will be surface treated to resist corrosion and wear using graphite lube. Then add O rings to seal it up and prevent leakage.

CNC machine advantages

a CNC machine advantages are unparalleled precision and rapid production speed to significant cost savings and enhanced safety. This is good because a CNC machine will make sure you have a precise product and at a fast speed too will allow you to make and use the parts as quick as saving money because parts can quickly move in and out the shop and less time wasting on checking parts because of the immense precision of a CNC machine.



Maintenance requirements

Routine inspection and cleaning, monitoring fluid levels and quality, maintaining proper fluid temperature, lubrication and seal maintenance, regular filter replacement, and optimizing system pressure settings. This allows the hydraulic system to be in a prime condition for longer.

Maximum loads

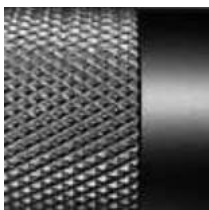
750-2,000 pounds per square inch

Some hydraulic grippers can hold the load weight of up to 4600 kg, can rotate the load at 90 degrees. Has energy chains which are used to protect and move hydraulic hose safely and without damages appearing.



Grip on the gripper

Knurling allows grip because the grooves and patterns increase friction and prevents any slips and it enhances the aesthetics of the product and enhances visual appeals also you can see whether the grip is damaged as the patterns will be faded or smoothed in and that will signal you to maintain the grip and change or if it's been over worked.



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iTECH 2460 Vertical CNC Drilling Machine | Scott+Sargeant UK

Hydraulic Grippers | Handling Concepts

knurling explain - Search

Task 2 Report

Assessment number (eg 1234-033)	8730-034
Assessment title	Employer-Set Project

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	2
Evidence title / description	Evidence expected for marking: Written report (typically 2000 words) Evidence submitted for marking: Written report (typically 2000 words)
Date submitted by candidate	DD/MM/YY

REPORT

Appropriate materials for the gripper will be steel because it can withstand high heats and heavy loads making it suitable for the job as a gripper. The properties of steel are listed: hardness, toughness, tensile strength, durability, thermal conductivity and resistivity, malleability. Steel can withstand up to 870 degrees Celsius and this is more than enough because the bar will be heated up to 600 degrees Celsius; steel can be recycled as a metal which is good for the environment as it's going to have another purpose after its life as a gripper. Also, steel is cost effective, more affordable compared to other materials. Brass is suitable because the gripper's handles will be knurled for grip and improves friction; also because the bar will be in a billet shape, the bar won't slide out of the gripper as the brass knurl will keep it steady. Brass is both strong and durable, making it suitable for the gripper. Brass can be recycled and the process to recycle is less energy intensive than steel, which is good for the environment. Also, steel won't get damaged with the heat of the 600 degrees Celsius steel billet, making sure you have a product that will last longer and won't need replacements as often. For example, if you had lithium that will be damaged because its melting point is 108 degrees Celsius, that won't be appropriate. Steel is a good option because it's available and ready as it is in stock and stored in most supplying companies.

The mechanism I have chosen is hydraulic because they are actuated by hydraulic fluid acting on a cylinder or vanes. The advantages of a hydraulic mechanism are it lifts heavy loads, which makes it safer for manpower because man can get hurt lifting heavy loads constantly, whereas the gripper is an arm pressured by hydraulic. Having a hydraulic gripper reduces the risk of musculoskeletal injury due to repetitive strain injury. Avoids employer fatigue. Improves the efficiency of the production line. Reducing the risk of workplace accidents and damage to the product. Excellent gripping power, which will make using the gripper and the work space safer and less accidents happening. However, the disadvantages of a hydraulic system are bulky as they take up space in the working area, energy intensive because they require a large amount of energy because it's a system that needs to move and pressurise fluids, prone to fluid leaks due to wear and tear and the lack of maintenance, also mechanical stress but with regular and constant maintenance check ups will be reducing stress slightly. This will work because the gripper will be mounted on a plate with 12 holes, giving it maximum stability and safety, because the last thing a workplace needs is an accident and fill lots of paperwork.

To make the different parts, the best option will be a CNC (computer numerical control) machine because of its unparalleled precision and rapid production speed to significant cost savings and enhanced safety. This is good because a CNC machine will make sure you have a precise product and at a fast speed too will allow you to make and use the parts as quick as saving money because parts can quickly move in and out of the shop and less time wasting on checking parts because of the immense precision of a CNC machine. This is

good because less time on making parts more time on using the actual product. A CNC machine is relatively easy to use which means all ages of people in the industry can use it which enhances productivity time. The piston will most likely be made out of steel and be transformed into the shape by the process of a CNC machine for accurate dimensions and sizing. The accuracy of a CNC machine is way better than humans or files as the machine is numerically coded to be precise which is fit for purpose.

Then the piston will be surface treated to resist corrosion and wear using graphite lube. Then add O rings to seal it up and prevent leakage. The cylinder will be made out of steel and be transformed into the shape by the process of a CNC machine for accurate dimensions and sizing. Then the piston will be surface treated to resist corrosion and wear using graphite lube. Then add O rings to seal it up and prevent leakage. O rings are usually made from elastomers.

To power the gripper, you should use a Hydraulic power unit (HPU) which consists of a pump, motor and a reservoir to supply power to the hydraulic gripper. Some advantages of a HPU are that the high power to weight ratio which means the hydraulic power units have an extremely high power to weight ratio which is suitable for a consistent production line. The powerful performance hydraulic systems can generate immense lifting force with minimal applied force. Also, the force amplification is good for lifting. Easy to use and install. Has versatile adjustments for the requirements needed at the production line. A HPU has consistent torque and force meaning the job will run smoother and safer. Has great stability and speed making the job run fast and less time taken to adjust. The HPU is safe and easy to control which makes the workspace and workers safe as less injuries will happen. Average costs of a HPU are £150 - £ 750 this can be seen as a valuable asset. This method was selected because its easy to use and safe to use and readily available.

The maintenance requirements are routine inspection and cleaning, monitoring fluid levels and quality, maintaining proper fluid temperature, lubrication and seal maintenance, regular filter replacement, and optimizing system pressure settings. This allows the hydraulic system to be in a prime condition for longer. As for the grip on the gripper the knurled section can be checked to see if the pattern has been faded away or if it's worn out, if there is a spill on it you can wipe it down with a cloth. The pattern allows you to visually see any damage as it won't be and also feel any damage as it's a 3d like ridges. You should document any damages that the machines have because that will maximize safety of the users.

Health and safety towards the proposed approach will be using the hydraulics only as intended, inspect systems before use, repair leaks before operating, shut down malfunctioning hydraulic systems, use proper personal protective equipment (PPE), keep body parts away from moving hydraulics, use proper lockout/tagout (LOTO) procedures for hydraulic system maintenance and get proper hydraulics system training. The PPE must be provided by the shop floor manager or you can buy your own if needed.

Using material that can be recycled is good for the environment because it conserves natural resources and reduces the demand for raw materials. Requires less energy to recycle than processing virgin materials, leading to energy savings. Recycling industrial materials reduces greenhouse gas emissions and minimises the use of pollutant fuels. Which means you will have a clean, safe working environment and have energy saving bills.

Weight of the billet is 16kg. gravitational force is 9.81m/s^2 .

Weight = $16\text{kg} \times 9.81 = 157.2\text{ N}$. the force due to the weight of the billet is 157.2 N

Work = force x distance

Work = $157.2\text{ N} \times 3\text{m} = 471.6\text{ Joules}$

So, the maximum load of the hydraulic grip must handle to lift or hold the 16kg steel billet is 157.2N. And moving the billet 3m the work done would be 471.6 Joules however the load remains the same unless any other factors such as: friction or additional force.



Knurled handle shows the pattern and the grip that will be on the gripper.



Hydraulic cylinder basic aluminium one £1,248.00



Piston of a hydraulic system. £368.69



HPU- hydraulic power unit £721.87



CNC machine £8,340.00



Brass bar of 69.9mm (2 3/4") diameter brass round bar length of 1000mm costs £804.44

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RAC204, 218 kN Capacity, 100 mm Stroke, Aluminium Hydraulic Cylinder | Enerpac GB

Hydraulic Piston 230V Before Max 4.5 M Reversible Blues 5R Telcoma BLUES5R | eBay

69.9mm (2 3/4') Diameter Brass Round Bar

iTECH 0613 60x120 Multi Material Desktop CNC 230V 1PH | Scott+Sargeant UK

Flowfit Hydraulic AC Power unit, 240v, Single phase, Single Acting Circuit, 2.2Kw, 5.32L/min

[https://www.bing.com/search?q=why%20is%20it%20good%20to%20use%20recycable%20](https://www.bing.com/search?q=why%20is%20it%20good%20to%20use%20recycable%20materials&qsn&form=QBRE&sp=-1&ghc=1&lq=0&pq=why%20is%20it%20good%20to%20use%20recycable%20materials&sc=12-41&sk=&cvid=B19607ED2E7D48C4BFB056520B0D932A&ghsh=0&ghacc=0&ghpl=)

[materials&qsn&form=QBRE&sp=-](https://www.bing.com/search?q=why%20is%20it%20good%20to%20use%20recycable%20materials&qsn&form=QBRE&sp=-1&ghc=1&lq=0&pq=why%20is%20it%20good%20to%20use%20recycable%20materials&sc=12-41&sk=&cvid=B19607ED2E7D48C4BFB056520B0D932A&ghsh=0&ghacc=0&ghpl=)

[1&ghc=1&lq=0&pq=why%20is%20it%20good%20to%20use%20recycable%20materials&sc=](https://www.bing.com/search?q=why%20is%20it%20good%20to%20use%20recycable%20materials&qsn&form=QBRE&sp=-1&ghc=1&lq=0&pq=why%20is%20it%20good%20to%20use%20recycable%20materials&sc=12-41&sk=&cvid=B19607ED2E7D48C4BFB056520B0D932A&ghsh=0&ghacc=0&ghpl=)

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Task 3 Design

Assessment number (eg 1234-033)	8730-034
Assessment title	Employer-Set Project

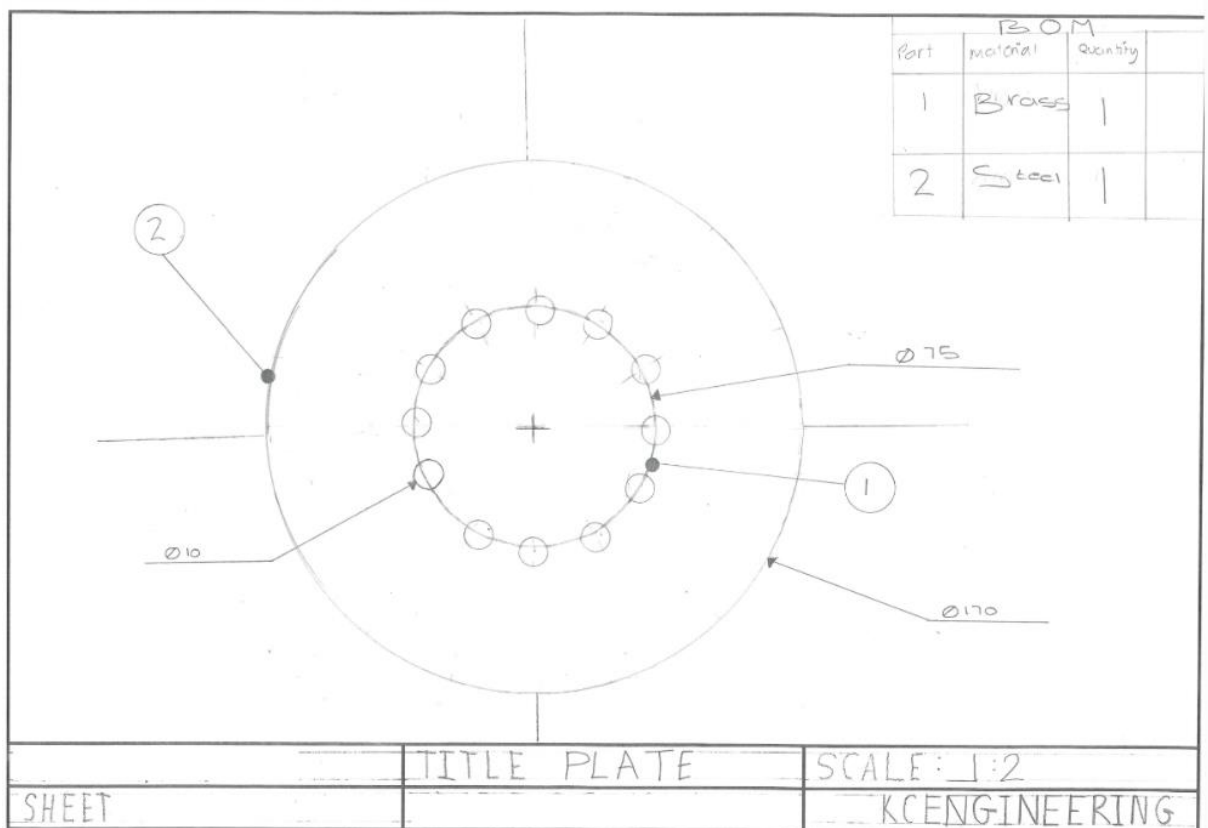
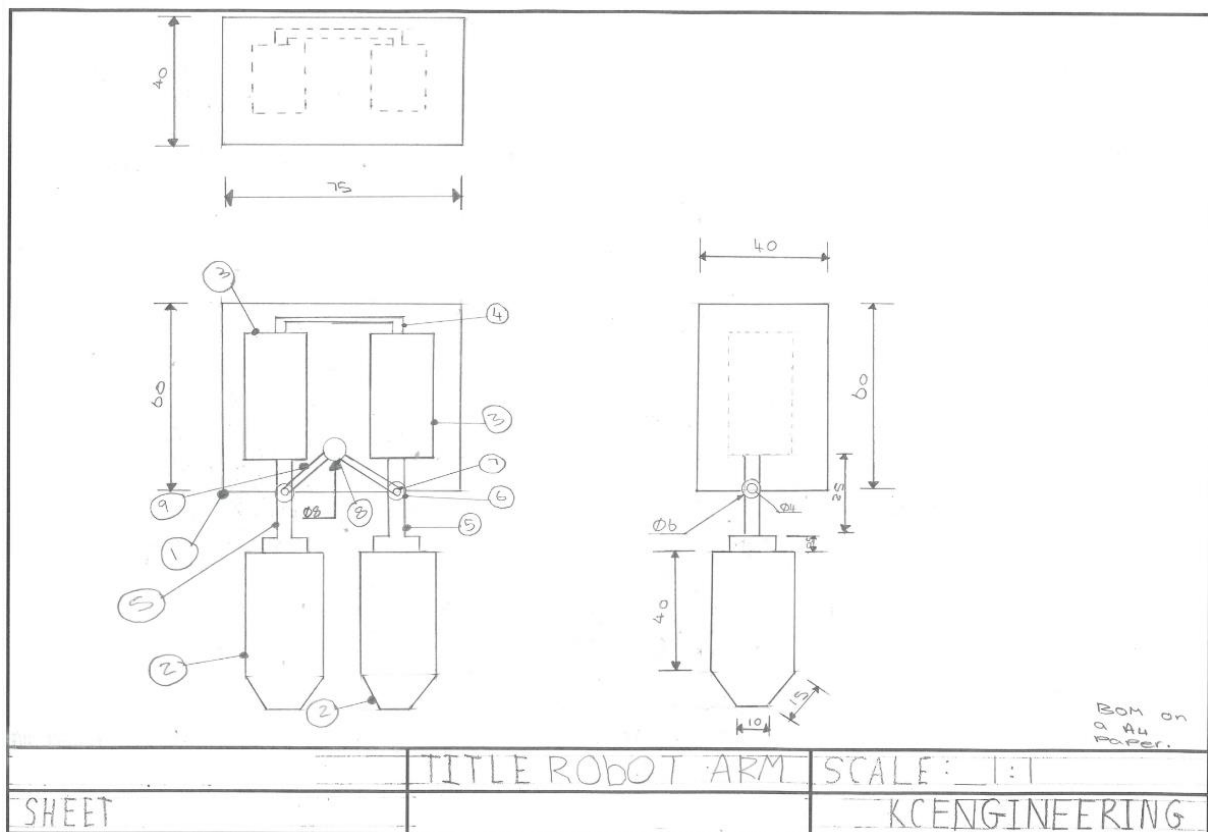
Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

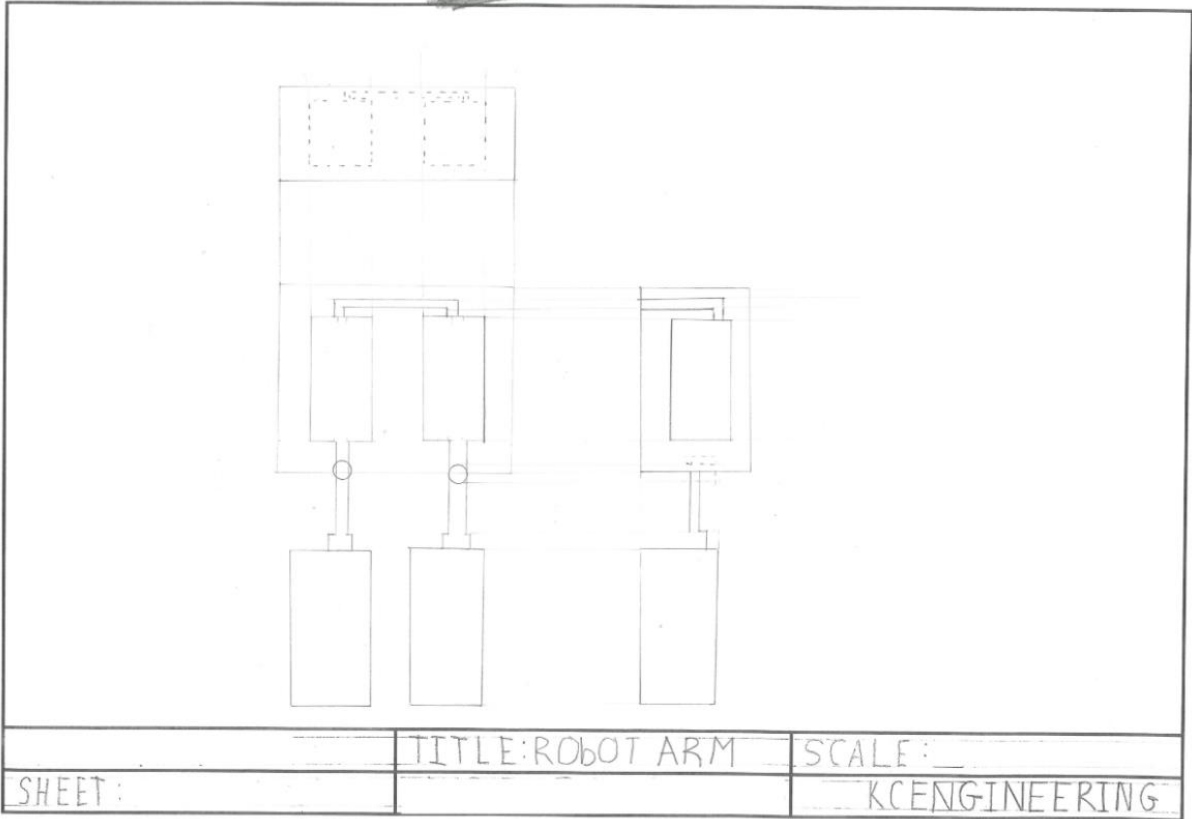
Task(s)	3
Evidence title / description	Evidence expected for marking: Part A – Annotated assembly design drawing for the gripper (A3 size) and a dimensioned drawing for parts in contact with steel billets (A3 size) Part B – Supporting design calculations and reflective notes (typically two sides of A4) Evidence submitted for marking: Part A – Annotated assembly design drawings
Date submitted by candidate	DD/MM/YY

the bill of
material for the
Robot Gripper.

BOM		
Part	material	quantity
1)	steel	1
2)	steel	2
3)	brass	2
4)	steel	1
5)	steel	2
6)	brass	2
7)	steel	2
8)	steel	1
9)	brass	2



~~Rough sketch~~



Task 4 Present

Assessment number (eg 1234-033)	8730-034
Assessment title	Employer-Set Project

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	4
Evidence title / description	Evidence expected for marking: Presentation materials Evidence submitted for marking: Presentation materials
Date submitted by candidate	DD/MM/YY

Gripper presentation

MATERIALS

The material I chose for the gripper was steel and brass because they can with stand high heats while being in contact with the steel billet. Brass will be used for the knurling of the actual grip because its strong and increases friction. Steel is tough, thermal conductivity and resistivity which makes steel an appropriate option.



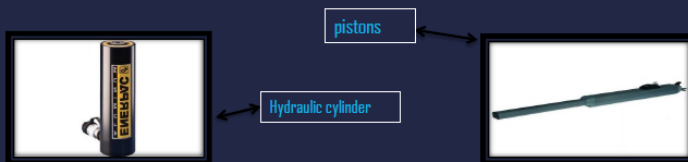
Brass bar

knurled



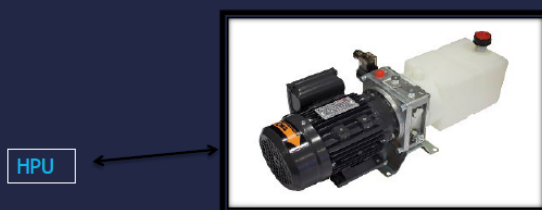
SUITABLE MECHANISMS

- ❖ I chose hydraulic mechanism because its safe and decreases bodily strain to humans if they was constantly lifting 16kg.
- ❖ It will function with 2 cylinders that will flow the fluids to the arms of the gripper. 1 cylinder for each arm and a tube connecting them in case 1 cylinder fails it can siphon fluid into the failed cylinder.
- ❖ Hydraulic mechanisms have excellent gripping power and it improves the efficiency of the production line.
- ❖ 2 pistons to move the grip into position



POWERING THE GRIPPER

- ❖ The method I chose was a hydraulic power unit (HPU) because it has an extremely high power to weight ratio making the production efficient. A HPU can generate immense lifting force with minimal applied force making the job effective with less energy used.
- ❖ I chose this because its easy to install, great stability and speed for the job.



MANUFACTURING THE PARTS

- ❖ The process used to manufacture the parts will be done by a CNC machine. I chose this because the advantages of a CNC machine are: unparalleled precision, rapid production speeds to significant cost savings and enhanced safety. Which allows money saving steps to running a production line overall.



MAINTENANCE REQUIREMENTS

- ❖ Routine inspections to find any damages and faults and log any damages.
- ❖ Monitoring fluid levels and quality and keep track of any anomalies
- ❖ Maintaining proper fluid temperature to make using the gripper efficient
- ❖ Lubrication and seal maintenance
- ❖ Regular filter replacement
- ❖ Optimising system pressure settings to ensure work done is safe and secure
- ❖ All of these maintenance requirements allows you to have a hydraulic system to be in its prime condition.
- ❖ The gripper allows these maintenance requirements to be done because there will be a thermostat to track temperatures of fluids. Also, the filter replacements can be maintained because you can visually see damages and the actual grip will be knurled and you can visually see damages because the pattern won't be regular and also you may feel for damages which will notify you to either change the gripper.

MAXIMUM LOADS

- ❖ Weight of the steel billet is 16kg
- ❖ Gravity is 9.81m/s^2
- ❖ $16 \times 9.81 = 157.2\text{n}$ which is the force due to the weight of the steel billet
- ❖ $\text{Work} = \text{force} \times \text{distance}$
- ❖ $\text{Work} = 157.2\text{n} \times 3\text{m} = 471.6 \text{ joules}$
- ❖ So the maximum load of the hydraulic grip must handle to lift or hold the 16kg steel biller is 157.2 n. Unless any other factors such as: friction or additional forces acting

HEALTH AND SAFETY

- ❖ Inspect system before use that allows you to be safe while using or being around the gripper and if damages found report them.
- ❖ Repair leaks before operating allows the workspace to be clean and safe
- ❖ Shut down malfunctioning hydraulic systems in order to keep yourself and surrounding safe.
- ❖ Receive proper hydraulics systems training
- ❖ PPE must be provided and worn at all times

CHALLENGES

- ❖ Making sure the materials that can be handled with ease
- ❖ This was overcome by looking at a selection of materials suitable when handling the steel billets.
- ❖ Making sure I used components that are easy to understand and that are simple but effective
- ❖ This was overcome by looking at different systems and the parts that are used by best selling companies.

HOW WELL I THINK MY DESIGN MEETS THE REQUIREMENT

- ❖ I think my design and proposal meets the requirements because I made a simple design which does the job of gripping and moving the hot steel billet and the system is effective and isn't time consuming also my design is safe for the shop floor.
- ❖ I think I've met all the requirements that are needed and think I did well overall.

CHANGES IF REPEATING

- ❖ If I was to repeat I would change the body shape instead of being squared I would change it that the corners are chamfered matching the grip. Also adding a digital monitor which displays the temperature and pressure of fluids and the piston pressure. But overall no major changes.

Final design

- ❖ My final design was a gripper that had a boxed body where inside was 2 cylinders with a connection tube connecting the 2 cylinders in case 1 cylinder needs siphoning. There are 2 pistons coming out of the boxed body that are connected to the actual grippers and there is are 2 connection points on each arm and they are connected which will move like a conveyor to make the arms go out at a certain distance and position. The arm movement on the connection makes the grip cover the steel billet to desired position and holding grip will be comfortable and safe.

Research images



Employer-Set Project – Presentation Q & A Record (Task 4)

8730-13 T Level Technical Qualification in Engineering, Manufacturing, Processing and Control

8730-034 Employer-Set Project (Summer 2025)

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234
Date	DD/MM/YY

Provider name	<provider name>
City & Guilds Provider No.	999999a

Record observation notes below to inform external marking. **Notes must be detailed, accurate and differentiating.**

Tutor questions to candidate	Candidate responses
What method of manufacturing did you consider?	CNC machine
What is the most challenging aspect of the project?	Box body, fixing the connection
What additional information will you provide with respect to the project??	The arms modification

Any other comments

Tutor signature	Date
	DD/MM/YY

If completing electronically, double click next to the 'X' to add an electronic signature once the record is **finalised**.

Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: technicals.quality@cityandguilds.com

W: <http://www.cityandguilds.com/tlevels>

Web chat available [here](#).

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