T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Engineering, Manufacturing, Processing and Control (8713-33)

Fitting and Assembly Technologies (331)

Guide standard exemplification material
Distinction – Sample 2022

First teaching from September 2022
Version 1.0

City & Guilds | eal

Contents

Introduction

The sample assessment materials within this document refer to the Fitting and Assembly Technologies sample occupational specialism assignment. The aim of these materials is to provide centres with examples of knowledge, skills and understanding that attest to **distinction** grade.

The examples provided do not reflect all evidence from the sample assignment as the focus of this material is the quality and standards that need to be achieved rather than the volume of exemplar evidence provided. However, the examples provided are representative of all tasks in the sample assignment. The evidence presented here has been developed to reflect **distinction** grade within each task but is not necessarily intended to reflect the work of a single candidate. It is important to note that in live assessments a candidate's performance is very likely to exhibit a spikey profile and the standard of performance will vary across tasks. A **distinction** grade boundary will be based on a synoptic mark across all tasks.

The materials in this Guide Standard Exemplification Material (GSEM) are separated into the sections as described below. Materials are presented against a number of tasks from the assignment.

Task

This section details the tasks that the candidate has been asked to carry out, what needs to be submitted for marking and any additional evidence required. Also referenced in this section are the assessment themes the candidates will be marked against when completing the tasks within it. In addition, candidate evidence that has been included or not been included in this GSEM has been identified within this section.

In this GSEM there is candidate evidence from:

- Task 1 - Planning
- Task 2 - Production
- Task 3 - Quality review and evaluation.

Candidate evidence

This section includes exemplars of candidate work, photographs of the work in production (or completed) and practical observation records of the assessment completed by centre assessors. This will be exemplar evidence that was captured as part of the assessment and then internally marked by the centre assessor.

Photographs in this GSEM demonstrate the full process that the candidate has undertaken to complete the drill jig assembly. Commentary sections detail where performance is considered to be at a level reflective of a distinction grade. Note, due to the nature of this process, not all individual work activities would provide opportunity to demonstrate a defined level of differentiation beyond a pass – but these images are shown in order to show the cohesiveness of the process being undertaken, and to draw out where differentiation is possible.

Commentary

This section includes detailed comments to demonstrate how the candidate evidence attests to the performance standard of **distinction** by directly correlating to the grade descriptors for this occupational area. Centres can compare the evidence against the performance indicators in the marking grid descriptors within the assessor packs, to provide guidance on the standard of knowledge, skills and understanding that need to be met for **distinction**.

It is important to note that the commentary section is not part of the evidence or assessment but are evaluative statements on how and why that piece of evidence meets a particular standard.

Grade descriptors

To achieve a distinction a candidate will typically be able to:

Competently and thoroughly interpret technical information, applying technical skills to plan, assess risk and follow safe working methods to practical tasks and procedures to an exemplary standard in response to the requirements of the brief, producing an excellent quality of work that meets tolerances, regulations and standards.

Thoroughly prepare working area, mitigating potential risks prior to commencing tasks and consistently apply exemplary housekeeping techniques during tasks.

Demonstrate exemplary technical practical skills in cutting, shaping, fitting, drilling, assembly and commissioning activities that are in line with industry standards and meet the requirements of the brief.

Demonstrate exemplary ability to follow procedures to produce or maintain working components.

Work safely and make informed and appropriate use of tools, materials and equipment within the working environments for cutting, shaping, fitting, drilling, assembly and commissioning activities.

Identify causes and diagnose problems or common issues related to fitting and assembly and have a thorough understanding and the skills to be able resolve and rectify them.

Consistently and accurately use industry and technical terminology across different communication methods with full consideration of technical and non-technical audiences.

Task 1 – Planning

(Assessment themes: Health and safety, Planning and preparation)

For task 1, candidates need to produce the following pieces of evidence:

- a resources list with justifications for the selections and measuring equipment calibration check recorded
- a risk assessment
- a method statement with justifications
- a quality check sheet.

For task 1 candidates will be expected to produce a quality check sheet to use in task 3a during the quality inspection task. This is supporting evidence for assessors to gauge the candidate's planning skills and will not be marked.

No photographic or video evidence is required for task 1.

Candidate evidence

1. Resources list with justifications for the selections and measuring equipment calibration check recorded

Requirements and resources	Task	Quantity	Justification
Tools/equipment/materials/consumables			
Pen and paper	1	N/A	So that I can plan my work and add any notes needed for the job.
Material stock for drill jig: mild steel plate various sizes need (60X70X10, 15X40X10.50, 15X80X10, 80X100X10) all measurements in mm	2	5	Stock needed so that it could be cut and filed to size as per specification, and the correct holes drilled and threaded as per drawing specification.
Dowels to hold side supports to base plate 6mm diameter BDMS round bar 18mm long	2	4	Need to secure the side supports to the base plate so that the whole assembly can be put together.
Datum table	2 and 3	1	Needed for marking out purposes in conjunction with the Vernier height gauge, and to check the work pieces for flatness once fitting has been completed to quality check part.
Angle block	2 and 3	1	Used to ensure that the workpiece is perpendicular to the datum table when marking out to ensure that the measurements are accurate.
Pillar drill	2	1	Needed to drill the several holes into the stock as per drawing specification.
Drill bits (3.2, 5,6,6. 8,10mm)	2	5	Various sizes needed to drill the hole, due to pilot holes needed. Tapping drill sizes as well as the finished hole diameters for drill jig. As per drawing specification.
Bench vice	2	1	Used to hold the stock in place when establishing datum and cutting workpieces to size.
Soft jaws	2	1	Used to protect the workpieces surface finish from damage to ensure it is within drawing specification.
Scribe	2	1	Needed for marking out, in conjunction with steel rule/engineers square. However, Vernier height gauge, datum table and angle block are a more accurate way of marking out.
Engineer's square	2 and 3	1	Used to check for squareness when establishing the datums on the workpiece, and to mark out lines square to the workpiece if required. However, the datum table, Vernier height gauge and angle block are a more accurate method.

Hand file (10” and 12” files, smooth, Intermediate and hard files)	2	3	Needed to establish the datums on the workpieces and to file the stock to correct size as per specification. Also used for achieving correct surface finish.
Hacksaw frame and blade 18TPI	2	1 (and 1x spare blade)	To cut the stock to size as per drawing specification.
Centre dot	2	1	Used to mark the hole centres as per drawing. Centre dot used first to make a small centre dot mark due to the more acute angle on the tip of the centre dot.
Centre punch	2	1	Used for the finishing centre punch mark due to the larger angel on the centre punch tip to locate the drill bit tip when drilling is carried out.
Tap wrench	2	1	Needed to use the taps when cutting the threads into the holes in the workpiece as per drawing specification.
Tap sets (M6, M8)	2	2	Needed to tap the holes needed as per drawing specification using taper tap, intermediate, and plug tap to ensure the threads are completely cut.
2lb ball piece hammer	2	1	Needed to make the centre dot and punch marks on the stock during marking out process and to stamp initials on to the work piece upon completion.
Parallels	2	1 set	Needed to hold the workpiece parallel to the vice and perpendicular to the drill bit to ensure that the hole is drilled correctly.
Bolts (M6 hex head, M8 cap head)	2	M6x2 M8x2	M6 bolts needed to hold the top and front supports in place and the M8 bolt needed to hold the material in when being drilled in the jig.
Vernier height gauge	2 and 3	1	Used for marking out on the stock in conjunction with the datum table and angle block.
Vernier calliper	2 and 3	1	Used to measure workpiece and to quality check the workpiece upon completion.
DTI	2 and 3	1	Used to check the flatness of the workpieces in conjunction with the datum table.
Engineer’s blue	2	1	Used to check for high spots on the workpiece.
Marking out dye	2	1	Used to blue the surface of the stock so that the scribed lines are more visible.
Trefolex cutting compound	2	1	Used for lubricating the cutting edges of the drill bit when drilling the holes into the workpiece to prevent burning the drill bits out and lubricating the cutting edges of the taps when cutting the internal threads.
Emery cloth (course and smooth)	2	2	Used to remove the engineers blue from the workpiece and to polish the surface finish of the work piece in line with the drawing

			specification. Course emery cloth used first then moved to the smooth to remove the scratches and then to a worn emery cloth to achieve the correct surface finish.
Anti-corrosive surface treatment	2	1	Needed to protect the workpiece from corrosion upon completion of the workpiece.
Computer access	3	N/A	Needed to write up the report and to note all of the measurements once I have quality checked the workpiece to ensure it is in line with the drawing specification.
Personal Protective Equipment (PPE)			
Gloves	2	1 pair	Needed to protect hand from any cuts or scrapes when working on the hand fitting activities. Not to be worn when using the pillar drill due to risk of entanglement.
Barrier cream	2	N/A	Needed to protect hands from harmful substances and to protect against dermatitis and other skin irritations. For example, when handling workpieces coated with engineer's blue.
Safety boots or safety shoes	All	1 pair	Needed to be worn in the workshop to prevent injury to feet if any objects are dropped and to ensure that you can change footwear to prevent dirt being tracked outside of the work area.
Overalls or coat (smock)	All	1 pair	Needed to protect yourself and clothing form dirt and debris from the work carried out. Ensure no loose clothing is worn around the drills due to risk of entanglement.
Safety glasses	2	1 pair	Needed to protect eyes from swarf and dust.
Technical Information/documentation			
Assignment brief	All	Needed for technical drawing and tolerances and assessment information.	
Calibration record	2 and 3	Needed to check that the equipment used is within calibration and up to date.	
User manuals	2	Needed for the pillar drill. To check operation instruction, safety information and maintenance instructions to check for suitable oils and lubricants.	
Risk assessment	All	This is a document that I will prepare to record the risks and hazards that may present during the creation of the bearing assembly. I will mitigate against the risks to reduce the likelihood of injury.	
COSHH data sheet	2	Needed for the hazardous substances which need to be used to ensure correct safety precautions could be followed.	
Method statement	2 and 3	This will be used during the tasks to ensure the correct sequence of operations is followed to ensure the quality requirements can be met.	

Quality check sheet	3	Needed to record measurements of finished workpiece to check it is within drawing specification.
General Workshop resources		
Waste disposal bins	All	Waste to be segregated to ensure all waste is disposed of correctly and to ensure materials can be recycled and hazardous substances are disposed of with registered waste carriers.
First aid kit	2 and 3	Needed in the case of any minor injury when carrying out the task.
Eye wash station	2 and 3	In case of emergencies, access to an eye wash station to treat any eye incidents to minimise injury before seeking medical treatment.
Warning signs and notices	2 and 3	To inform people of required PPE requirements, fire exits, first aid information and any hazards in the workshop such as wet floors spillages etc.
Dust pan and brushes and spill kits	2 and 3	Needed to clean work area and to clear up any spillages that may occur.
Mop and bucket	2 and 3	To clean up any spillages and clean the work area once job has been completed.
Calibration of measuring equipment		
All measuring equipment has been checked for calibration against the workshop record. Last calibration date was November 2021.		

Commentary

The candidate has carried out a thorough analysis covering all factors relevant to the brief with all justifications provided. They have applied their understanding to produce a comprehensive list of resources required, demonstrating comprehensive technical knowledge of the requirements required for producing the drill jig assembly.

The candidate has listed amounts for each resource that they have planned to use and has given detailed justifications for their selections. The candidate could have given longer justifications for their choice, giving an indication of the intended use. The candidate has given consideration for other resources that should be available in the workshop, for example, access to a first aid kit and the provision of an eye wash station.

The candidate has recognised the need to refer to supporting technical documentation in order to complete the task.

The candidate has demonstrated planning for safe working by identifying the correct PPE and stating why each piece should be used, including providing guidance on when gloves should not be used, for example, when operating the drill due to entanglement risk. They have included the use of a barrier cream to prevent dermatitis from handling materials with the substances such as engineer's blue.

1. Risk assessment

Hazard	Risk	Control	Likelihood	Severity
Tools and equipment	Cuts and grazes from sharp edges of material or incorrect handling of tools and tooling. Damaged tooling could break during use.	PPE (gloves, safety glasses) should be worn in the workshop at all times and adequate training and supervision should be provided before use. Tools and equipment should be handled carefully to prevent damage to tools and tooling. Follow PUWER regulations.	3	1
Operation of the pillar drill	Entanglement in rotating components (drill chuck, spindle) leading to bodily injuries, e.g. crush injuries, amputation, death.	Correctly fitting PPE (overalls or coat, gloves, safety glasses and safety shoes) needs to be worn, and also need to ensure that people with long hair tie it back, remove jewellery and do not wear loose clothing (ties) or incorrectly fitting PPE (e.g. overalls with loose or long baggy sleeves). Fixed guards should be used at all times, checks made prior to using the drill. If guards are loose or missing this will be reported and rectified before the machine is used. Follow PUWER regulations.	3	2
	Machine malfunction, failures. Injuries to person including cuts and grazes, electric shocks or burns.	Equipment will have regular planned maintenance to ensure equipment is in safe working order (PAT testing), taking machinery out of service as per PUWER regulations. Machines should be fitted with emergency stops and switches.	3	2
Incorrect application of drill speeds	Could result in broken bits, damage to drill, holding devices and damage to the workpiece, injuries to person.	Ensure the correct drill speeds are applied for the drill bits being used and the type of material being drilled to prevent broken or damaged drill bits. Apply lubricating fluids during drilling to cool the bit. Ensure eye protection is	3	2

		worn during drill operation in case of any breakages to protect the eyes from any debris.		
Incorrect drilling techniques.	Cuts and grazes to hands and arms, eye injuries from ejected swarf or broken drill bits.	Use correct drill bit and speeds for the material being drilled. Use centre punching to prevent drill bit slipping during drilling holes. Use a stepped approach when enlarging the drill holes to prevent overworking the drill bit to the material being used. Wear eye protection when operating the drill to protect the eyes in event of any ejected material.	3	1
Electricity	Electric shock, burns, electrocution from faulty wiring or earthing.	Guarding to motors and the internal parts of the machine. Pre-use checks, use of isolation methods, planned maintenance schedule.	2	2
Swarf and debris from machinery	Ejected debris coming off the drill or tooling, from working materials. Getting swarf in your eyes or cutting your hands when removing. Minor burns or scalds from hot swarf.	Take care when working and wear gloves (if necessary) and goggles when working on machinery (drills) to protect eyes when working with files and drills. Ensure fixed guarding is in place on any machine (drill) and use adjustable guarding where provided by the manufacturer (e.g. magnetic guards). Hot swarf to be removed from rotating parts using a brush or tool avoiding skin contact.	3	1
Falling objects from work bench	Risk of dropping material stock or equipment on to feet.	Wear correct PPE, either steel toe cap boots or safety shoes at all times while in the workshop. Careful placement of materials and tools on workbenches.	3	1
Slips, trips and falls	Spilt cutting fluids, file dust and chalk which could be slippery, trailing cables.	Ensure good housekeeping is followed at all times and clear up any spillages as soon as they happen, placing signage to inform others of the slippery	3	1

		surface once cleaned. Use of spill kits for correct waste disposal.		
Noise	Noise in the workshop could exceed safe working levels if many working at once. Damage to hearing.	Noise levels rarely exceed safe working levels as per Noise at Work Regulations but ear protection should be worn if required.	2	2
Manual handling	Carrying heavy material stock Musculoskeletal injuries.	Ensure training has been given. Use correct manual handling techniques are used by everyone in the workshop and ensure there is mechanical assistance available if required for larger and heavier materials per the manual handling regulations.	3	1
Liquids, chemicals and substances	Injuries to eyes (temporary, partial or total sight loss), skin conditions (irritants, dermatitis), respiratory conditions (asthma), spillages.	Check COSHH data sheet for handling, storage information, usage instructions, storage instructions, disposal instructions prior to using engineer's blue fluid and anti-corrosion spray products. Wear appropriate PPE (masks, gloves, overalls or coats) when handling and using any oils, lubricants or fluids. Use spill kit to clean up any spillages. Dry floors and surfaces to prevent slips. Put out signage to warn others of wet floor.	2	1

Likelihood		Severity	
1	Very unlikely to happen	1	Minor injury
2	Unlikely to happen	2	Major injury
3	Possible to happen	3	Loss of limb
4	Likely to happen	4	Death of an individual
5	Very likely to happen	5	Multiple deaths

Commentary

The candidate evidence demonstrates a thorough knowledge and understanding of the different types of risks and hazards associated with composite manufacturing activities. The candidate has considered and identified all the major hazards and associated risks for each of the tasks. The candidate has identified some areas of legislation covering a specific hazard.

The candidate has demonstrated an excellent understanding of the mitigations required that can minimise the risks and hazards and has identified thorough detail for the controls necessary.

The candidate has considered a wide variety of scenarios and situations that may arise, for example, including visitors who may be affected if they were in the workshop. This demonstrates that the candidate has a thorough knowledge and understanding of risk.

The potential for harm and probability of occurrence has have been identified throughout. The likelihood and severity has also been identified in respect of the hazards and risks occurring based on the processes the candidate will be using for the task.

1. Method statement

Drill jig assembly

This method statement covers the information needed to produce a brief working plan of the marking out and work schedule activity, including preparing materials, tools and ancillary equipment prior to starting the work.

Tools to be used – See resources list
PPE – Overalls, safety boots, safety glasses, gloves, barrier cream.
Drill Sizes And speeds: 5mm – 1000 Rpm, 6mm - 833 Rpm, 6.5mm – 800 Rpm, 6.8mm – 800 Rpm, 10mm – 500 Rpm

Applicable legislation:
Health & safety at work act (HASAWA)
Electricity at work regulations
Manual handling operations regulations (MHO)
Control of noise at work regulations
Provision and use of work equipment regulations (PUWER)
Control of substances hazardous to health (COSHH)

Additional Information:
S***pindle Speed (refer to Data Book)***
1000 x S/ π x d = Speed (rpm) - Use this formula to calculate spindle speeds for drilling, reaming, countersinking etc.

Work to be carried out:

- I will first interpret and analyse the brief and the technical drawings so I can understand what needs to be produced and understand the tolerances and assembly requirements.

- I will undertake a risk assessment, based on the tasks in the brief. Checking the work area for any potential hazards and risks, identifying the control measures to put in place prior to any practical work from being started.

- I will put on my full PPE required for the workshop and ensure my clothing (including jewellery) will not cause an entrapment hazard. I will check and clean my workstation and the surrounding area, check my risk assessment to ensure all potential hazards have been adequately controlled. I will clean and tidy any waste or debris left over from a previous user, disposing of waste in the designated waste bins.

- I will refer to my resources list and collect the materials, tools and equipment needed, checking they are fit for purpose before placing them in my work area. I will check the measuring equipment has been calibrated and mark the date on my resources form.

- I will carry out pre-use checks on the machinery. Checking the pillar drill is free from debris and is in good working order and all guarding is in place. I will set-up the pillar drill for use using a standard workshop SOP. I will then select the correct drill bits and tooling needed to complete the set-up of the pillar drill, following an isolation procedure to prevent any risk of injury during the setting up of the machinery, in reference to the PUWER regulations. For all tasks I will be following

a safe system of work to not endanger myself or others during the operation of the machinery and the undertaking of the tasks.

- To produce the components I will follow a process, firstly I will prepare all stock materials; I will use an intermediate file to file a datum on to a piece of stock material so I have a square end to make all of my measurements from. I will remove the material carefully to avoid removing too much material off the stock at once, using an engineer's square to check for high spots, continuing to remove material until the material was flat and square. I will repeat this for all stock pieces.

- Once I have established a datum, I will use engineer's blue metalworking fluid to blue the surface of the material and use a vernier height gauge on the surface table to clearly mark out the centre line, hole centres and the dimensions of the block. Before using any metalworking fluids I will check the manufacturers COSHH data sheet and wear the appropriate PPE, blue disposable gloves or barrier cream to protect my skin from exposure to the fluids. If any spillages occur, I will use a spill kit to clean up and dispose of the waste materials accordingly.

- Then with the holes and dimensions all marked out I will use a centre dot to make the initial marks which I will later punch. A centre dot is used to make it easier to line up with the scribed marks due to the sharper point. I will then check for accuracy and once happy will use a punch to mark the centre mark properly ready for drilling.

- I will first set up the drilling station. I will need to ensure the workpiece is square to the drill. To do this I will use a set of parallels and place the workpiece in the vice on top of the parallels. I will then check the alignment of the drill to the workpiece. To do this I will canter the drill to the centre punch mark, lightly bouncing the drill bit into the centre punch mark, checking to see if the drill bit is deflected, if deflected this means the mark was not lined up to the bit and would need adjusting. I would adjust the bed of the drill to line up the mark to the drill bit.

- Once lined up I will not move the bed or workpiece until all drilling operations are carried out to ensure the workpiece remains square. I will then drill the holes using a stepped approach, starting with a smaller sized drill to make the pilot hole and then gradually increasing the size of the drill bit to meet the desired hole size. I will use a cutting compound when drilling the holes to ensure the cutting edges are lubricated. This also reduces the risk of overheating the drill bit. I will remove any swarf build up regularly to prevent the swarf from becoming a hazard or damaging or affecting the performance of the pillar drill. If a drill bit does break during the task, I will follow the safety procedure to replace the drill bit. I will isolate the drill, carefully clear the debris from the area and remove the broken bit. I will replace the broken bit with one from the stores, updating the stores list before disposing of the debris in the appropriate designated waste bin. I will then re-check the bit before switching the drill on.

- I will perform a series of in-production checks, using measuring equipment to double check the positioning and depth of the holes to ensure they meet the requirements of the technical drawings.

- I will then complete this process for all the other components, following the exact same steps from establishing the datums to drilling the final holes and carrying out the in-production checks, checking for accuracy against the brief.

- Once all components have been produced, I will then produce the four steel dowels using to secure the side supports. These will be produced from a 6mm steel diameter rod, each rod will be cut to fit flush in the side supports and will be cut as to not protrude out of the base plate.

- Once all the components are to the correct dimensions, I will use some rough emery cloth to remove any markings, lines or surface imperfections before using a fine emery cloth to polish the surfaces to ensure I can get the correct surface finish for the job. I will then add a light and even spray coating of an anti-corrosion surface treatment to prevent any rusting.

- Referring to the technical drawings, I will assemble the drill jig, following a logical sequence of assembly. I will check the alignment of the top and bottom plates, checking the alignment of the drill holes.

- On completion of the assembly task, I will measure the components to check it meets the requirements of the technical drawings. The drill jig will be tested in the quality review task.

- I will then reinstate my workstation, the surrounding area, cleaning and sweeping up any swarf or debris, disposing of the waste in the designated bins. I will clean and check the tools and drill bits used, checking for any damage or wear before returning all of the tools and equipment used during the task to the correct storage area. I will ensure the area is clean and ready for the next user.

Commentary

The candidate evidence shows the candidate has carried out a thorough analysis of the brief producing a detailed method statement with good detail given in each stage of the production process. The level of detail is good, the candidate has included additional information such as the drill sizes and speeds and the formula used. The candidate has provided thorough reasoning for the steps they will take to produce the components and the assembly showing a thorough knowledge and understanding of the processes.

The candidate has displayed a comprehensive understanding of the order the activities should take place. The method statement produced follows a logical and methodical sequence to follow to manufacture and assemble the components to produce the drill jig.

The method statement is accurate throughout, detailed, and justified using the correct methods expected at this level e.g., understanding the use of datums and the use of measuring tools within the in-production checks and knowing how to check the drill alignment for improved accuracy.

The candidate shows a comprehensive knowledge of health and safety and have made reference to specific technical information (brief, resources list, risk assessment) as sources to be checked during the task, as well as referencing specific health and safety legislation to tasks, for example, application of metalworking fluids in accordance with COSHH and the manufacturer's data sheet.

Planning is thorough and the candidate has planned for problems and issues during the production tasks, for example, describing what they would do if they had a broken drill bit, the removal and clean up before sourcing another bit from the store and following workshop procedure to update the stores list.

1.Quality check sheet

Drill Jig Base

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	100			Vernier	
Material width	±0.50	80			Vernier	
Material thickness	±0.50	10			Vernier	
Hole Positions						
A	±0.50	10 x 20			Vernier	
B	±0.50	10 x 60			Vernier	
C	±0.50	22 x 25			Vernier	
D	±0.50	22 x 55			Vernier	
E	±0.50	35 x 34			Vernier	
F	±0.50	40 x 7.5			Vernier	
G	±0.50	40 x 72.50			Vernier	
H	±0.50	49 x 40			Vernier	
I	±0.50	60 x7.5			Vernier	
J	±0.50	60 x 72.5			Vernier	
K	±0.50	61 x 49			Vernier	
Surface Finish	±0	1.6 µm			Comparison gauge	
Flatness	±.05	0			DTI & Datum table	

Drill Jig Front Support Block

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	80			Vernier	
Material width	±0.50	15			Vernier	
Material thickness	±0.50	10			Vernier	
Hole Positions						
A	±0.50	20 x 10			Vernier	
B	±0.50	60 x 10			Vernier	
Surface Finish	±0	1.6 µm			Comparison gauge	
Flatness	±.05	0			DTI & Datum table	

Drill Jig Side Support Block

Components Dimensions	Tolerance (mm)	Required Size(mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	40			Vernier	
Material width	±0.50	15			Vernier	
Material thickness	±0.50	10			Vernier	
Hole Positions						

A Part 1	±0.50	10 x 7.5			Vernier	
B Part 1	±0.50	30 x 7.5			Vernier	
A Depth Part 1	±0.50	8			Vernier	
B Depth Part 1	±0.50	8			Vernier	
A Part 2	±0.50	10 x 7.5			Vernier	
B Part 2	±0.50	30 x 7.5			Vernier	
A Depth Part 2	±0.50	8			Vernier	
B Depth Part 2	±0.50	8			Vernier	
C Part 1	±0.50	20 x 5			Vernier	
C Part 2	±0.50	20 x 5			Vernier	
Surface Finish	±0	1.6 µm			Comparison gauge	
Flatness	±.05	0			DTI & datum table	

Drill Jig Top

Components Dimensions	Tolerance	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	75			Vernier	
Material width	±0.50	60			Vernier	
Material thickness	±0.50	10			Vernier	
Hole Positions						
A	±0.50	10 x 10			Vernier	
B	±0.50	10 x 50			Vernier	
C	±0.50	22 x 15			Vernier	
D	±0.50	22 x 45			Vernier	
E	±0.50	35 x 24			Vernier	
F	±0.50	49 x 30			Vernier	
G	±0.50	61 x 39			Vernier	
Surface Finish	±0	1.6 µm			Comparison gauge	
Flatness	±.05	0			DTI & datum table	

Comments

Task 2 – Production

(Assessment themes: Health and safety, Production (Measuring and marking out, Cutting components, Techniques and methods, Tools and equipment).

For task 2, candidates need to produce the following piece of evidence:

- functioning drill jig assembly.

For task 2, assessors will need to produce the following pieces of supporting evidence from completing the production activities:

- assessor observation:
    - prepared work area
    - preparation of tools and equipment
    - set up and use of workshop machinery
    - checks carried out before, during and after production.

Note: For the purpose of this GSEM, the assessor observations have been captured on one form. In delivery, assessors may choose to capture their observations on more than one form.

Photographic evidence required:

- Photographic evidence of the prepared work area – *not supplied for this GSEM but it is expected providers will record the condition of the work area prior to the candidate starting the work.*

- Photographic evidence showing stages of production of the drill jig components (e.g. setting up, marking out of materials, removal of material using equipment, finishing and assembly) - *Illustrated in task 2 photographic evidence section below (photographs 1- 9)*

- Photographic evidence of the completed drill jig assembly – *Illustrated in task 2 photographic evidence section below (photographs 10 - 11)*

Note: Additional photographs or video may be used to capture other elements of the production process for reference, although this is not a mandatory requirement.

Photographs in this GSEM demonstrate the full process that the candidate has undertaken to complete the drill jig assembly. Commentary sections detail where performance is considered to be at a level reflective of a distinction grade. Note, due to the nature of this process, not all individual work activities would provide opportunity to demonstrate a defined level of differentiation beyond a pass – but these images are shown in order to show the cohesiveness of the process being undertaken, and to draw out where differentiation is possible.

2. Photographic evidence - Production

Photograph 1 – showing the raw stock materials selected for the task.

Photograph 2 – showing the correct use of tools to check for squareness for each component part of the assembly.

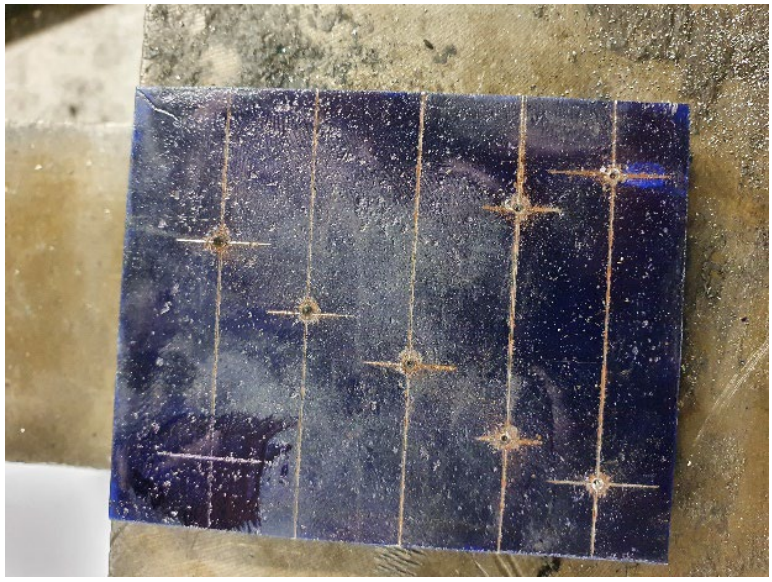
Photograph 3 – showing the datums being established using a file.

Photograph 4 - showing the preparation of the material, engineer's blue has been neatly applied even to the stock.

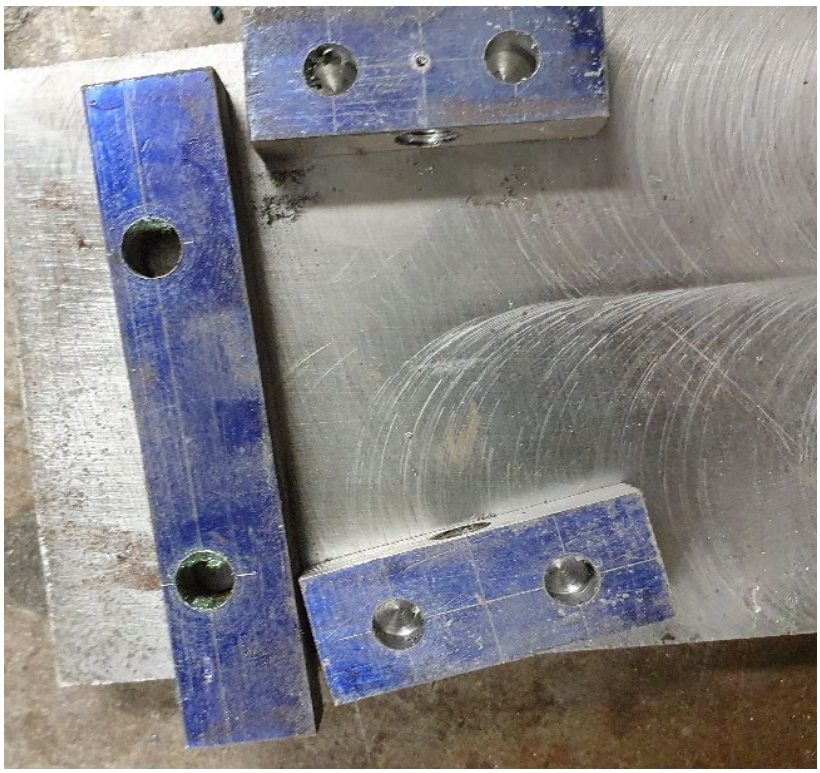
Photograph 5 – showing the safe use of equipment. The pillar drill should be operated using correct PPE and with all guarding in place.

Photograph 6 – showing the correct use of a Vernier height gauge, performing in-production checks. Candidates will be expected to carry out frequent in-production checks during the production of the components for the drill jig assembly.

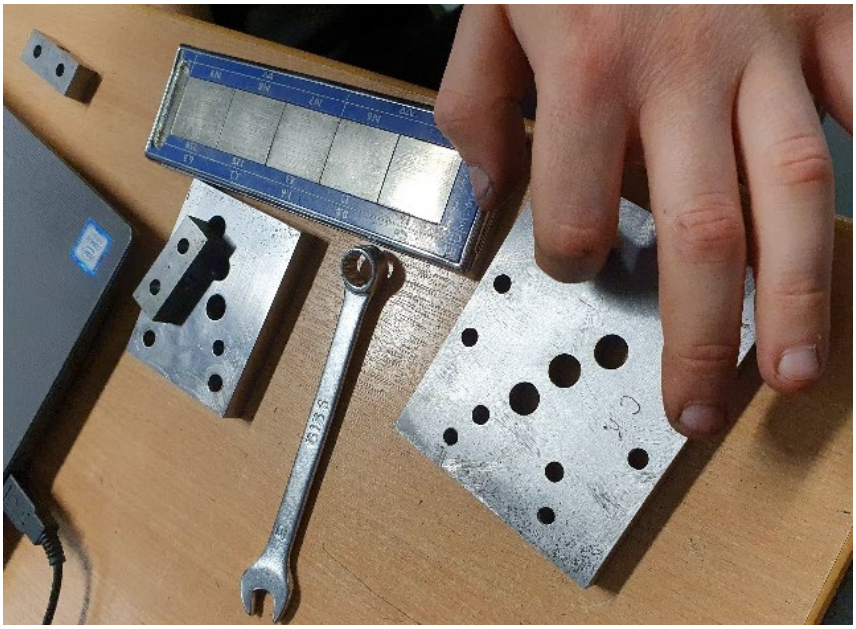
Photograph 7 – showing the pilot holes set out for the drill jig top plate.



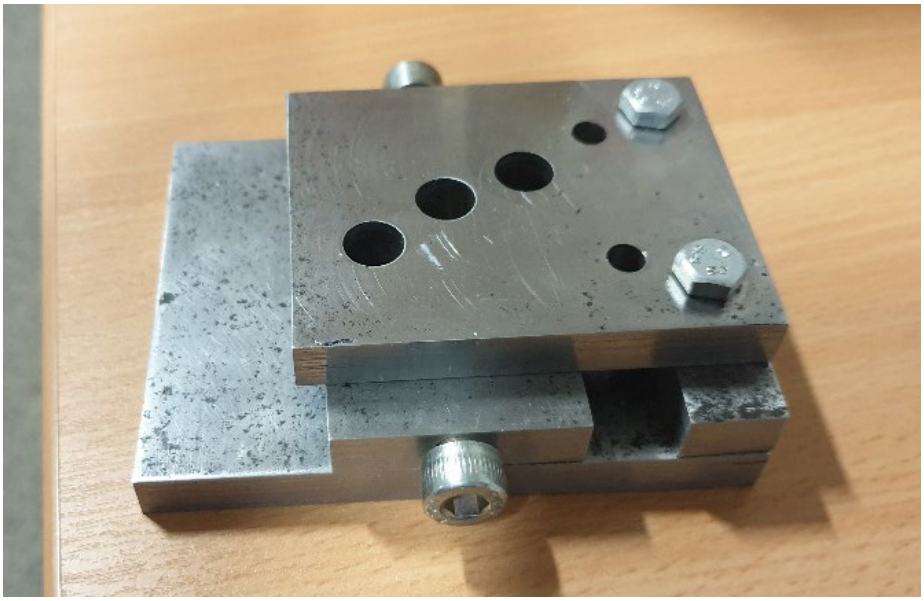
Photograph 8 – showing the front support block and the two side supports components, prior to finishing.



Photograph 9 – showing the completed components prior to assembly.



Photograph 10 – showing the completed drill jig assembly. The alignment of the parts are good. The surface finish meets the drawing requirements, all millscale has been removed to a true surface finish. All parts are flush and in line. The side supports are interchangeable and can be used on either side. The dowel pins (not shown) are flush with the base plate.



Photograph 11 – showing the expected alignment of the finished drill jig. The top plate, front support and bottom plate all sit flush.

2. Practical observation form – Producing the drill jig assembly

Assessment ID	Qualification number
8713-332	8713-332
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Planning & preparation, Production, Health & safety, Assembly

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Setting up and preparing the materials, tools and equipment	The candidate put on their PPE (safety boots, overalls, safety glasses, barrier cream) demonstrating pre-use and suitability checks. Work area prepared, referenced risk assessment, control measures were in place. Work area cleaned down; waste disposed of in accordance with workshop procedures. Resources list referred to, all tools and measuring equipment located and placed locally so movement around the workshop minimised. Each tool was checked for cleanliness and pre-existing damage. All measuring tools were checked for calibration. A standard workshop SOP was followed to prepare the machinery for use. Particular attention paid to the pre-use checks for the pillar drill, checking the spindle and chuck ensuring both were free of debris. Machine guarding visual and functionality checks undertaken.
Producing the components	The candidate selected their raw materials. Opting to produce the two side supports first. Datums established on the two sides to mark out the dimensions and hole centres. Good accuracy. Datums established using an intermediate file, removing small amounts of material at a time, before checking for high spots using an engineer's square. Material was flat and square. Engineer's blue used to blue the surface of the stock to mark out the dimensions and hole centres. Holes were marked for the dowel pins and the M10 tapped hole. Centre lines were marked. Good accuracy was demonstrated. All dimensions and hole centres marked out using a centre dot to make initial marks. Candidate checked the measurements before punching the initial marks. No additional surface marks observed. Workpiece was squared to the drill, using a set of parallels, placing the workpiece in the vice on top of the parallels.

Utilising the machinery	The alignment of the drill to the hole centres was checked by cantering the drill. Some small re-alignment, adjusting the bed of the drill to line up the mark to the drill bit. Depth checked using a depth gauge, referring to the technical drawings. The candidate repeated this process to create the rest of the components (second side support, the front support and the top and base plates) applying the same methods, techniques and checks. The candidate made 4 steel dowels to secure the side supports cutting a 6mm diameter rod to fit flush in the side supports, the dowels did not protrude out of the base plate. The candidate used all calibrated measuring tools correctly throughout the production process, checking the dimensions of the machined components against the technical drawings. Small adjustments were made to ensure the correct dimensions were achieved. Pillar drill operated safely throughout. Holes drilled using a cutting compound. The candidate removed small amounts of material at a time, used stepped process - smaller pilot holes and stepping up the drill bit sizes to the finished diameter. All holes deburred. No drill bits were broken during the drilling. All swarf was brushed away and cleared from drill. The candidate referred to a Zeus book (engineer's handbook) to find out the correct drill sizes for tapped and clearance holes.
Assembly	Each component polished with a rough emery cloth, removing the mill scale and finished with a smooth emery cloth to the desired surface finish. Drill jig was assembled in correct order using appropriate hand tools. No adjustments were required to correct the alignment. An anti-corrosive surface treatment was applied.
Health and safety and work area	Health and safety followed throughout all tasks. Correct PPE was worn throughout. Machine guards were utilised throughout. Candidate followed standard operating procedures of machine isolation when changing tooling and cleaning down the machinery. Work area cleaned and reinstated. Waste disposed in designated bins. All tools and equipment cleaned, checked and returned to storage.

Assessor signature	**Date**
Assessor A	**17.12.2021**

Commentary

The observation evidence shows the candidate has demonstrated their comprehensive understanding and knowledge of preparing the work area and mitigating potential risks prior to commencing tasks and consistently applying exemplary housekeeping techniques during tasks, with consideration for the waste disposal requirements.

The candidate demonstrated a comprehensive knowledge and understanding of the methods and techniques to prepare the materials, use appropriate tooling techniques to give the best possible finish and know their disposal requirements.

They demonstrated comprehensive understanding of measurement, specifically when preparing the materials for machining and throughout the production process to check for accuracy.

The candidate demonstrated exemplary ability to follow procedures to produce or maintain working components by utilising the standard workshop SOP, using their comprehensive knowledge, and understanding to set up the work area to enable machining activities to commence safely.

The candidate demonstrated exemplary technical practical skills in machining the materials to produce the individual components using machinery and hand tools to meet the requirements of the brief. Material deburring and material removal techniques and methods were demonstrated, all material removal was carried out with a comprehensive understanding of the need for accuracy, for example, only removing small amounts of material at a time avoiding removing too much in one pass.

The candidate demonstrated their understanding of the machining process to identify causes and diagnose problems within the machining process and demonstrated the knowledge, understanding and the skills to be able resolve and rectify them, for example, checking the alignment of the drill to the workpiece by cantering the drill, checking the alignment of the drill bit to the centre of the marked drill centre and then if needed making subtle adjustments where needed.

The candidate demonstrated their ability to work safely and to follow safe operating practices throughout the machining, showing a comprehensive knowledge and understanding of health and safety. They demonstrated this through safe use and ensuring their work did not affect the machinery which could then affect others.

The candidate's comprehensive application of tool skills and the accuracy of their machining resulted in a high quality finish and met the specification of the finished assembly.

Task 3a – Quality review

(Assessment themes: Health and safety, Quality review and evaluation (quality review, reporting, recording and handover)

For task 3a, candidates need to produce the following pieces of evidence:

- completed quality check sheet
- a sample drilled part (created using the completed drill jig assembly).

For task 3a, assessors will need to produce the following pieces of supporting evidence:

- assessor observation:
    - usage of measuring equipment
    - accuracy of drilled holes sample and measurements taken.

Photographic evidence required:

- photographic evidence of the completed drill jig assembly and the sample drilled part - *Illustrated in task 3 photographic evidence section below (photographs 12 - 15)*

Video evidence required:

- video evidence of the creation of the sample drilled part.

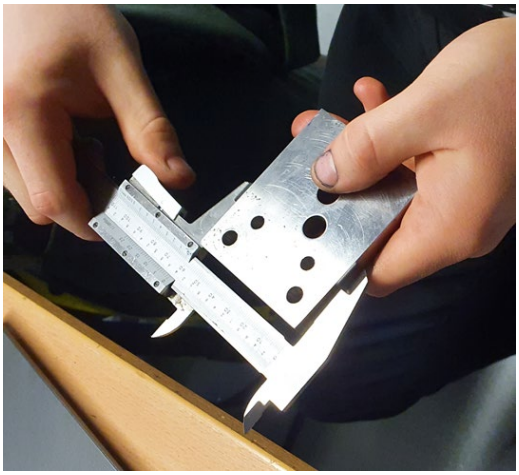
The following task 3c supporting evidence has not been included for this version of the GSEM:

Video evidence:

- video evidence showing the creation of the sample drilled part.

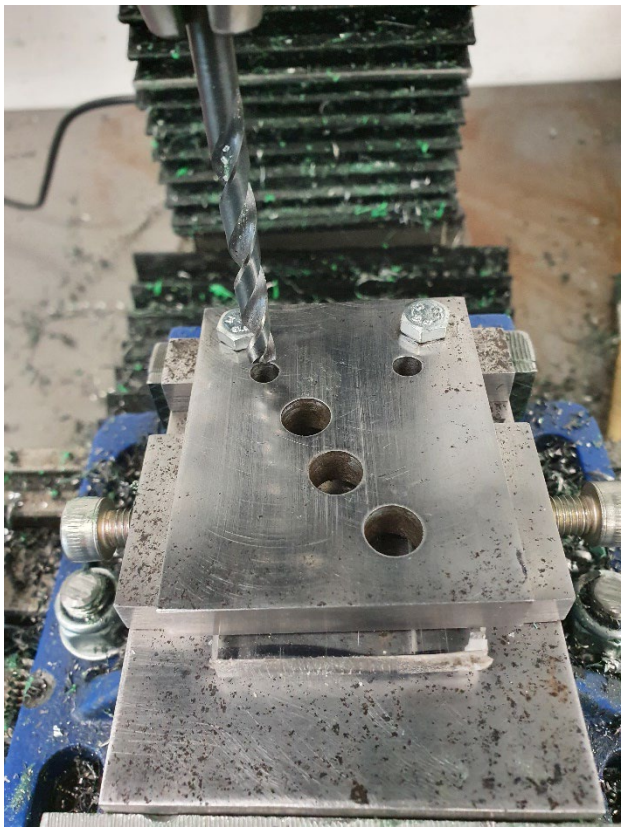
3a. Photographic evidence – Quality review

Photograph 12 – showing the candidate measuring the accuracy of the top plate.

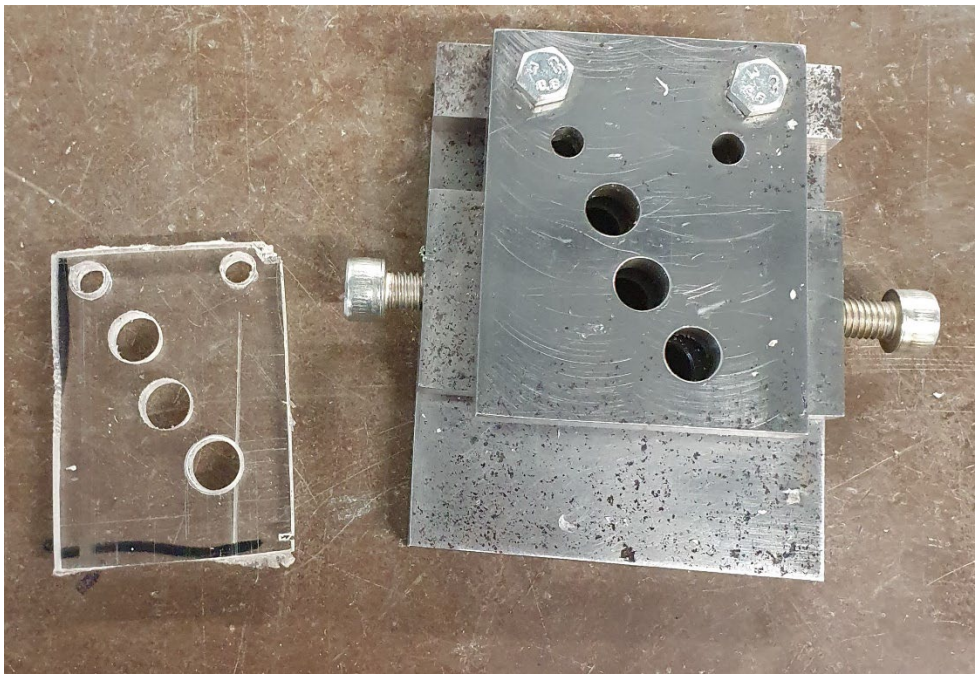


Photograph 13 – showing the assembled drill jig assembly.

Photograph 14 – showing the sample part being drilled.



Photograph 15 – showing the drilled sample part.



Candidate evidence

3a. Completed quality check sheet

Drill Jig Base

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	100	100.00	0.00	Vernier	PASS
Material width	±0.50	80	80.24	0.24	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						
A	±0.50	10 x 20	10.22 X 20.22	0.22 X 0.22	Vernier	PASS
B	±0.50	10 x 60	10.24 X 60.20	0.24 X 0.20	Vernier	PASS
C	±0.50	22 x 25	21.72 X 24.82	0.28 X 0.18	Vernier	PASS
D	±0.50	22 x 55	22.02 X 54.76	0.02 X 0.24	Vernier	PASS
E	±0.50	35 x 34	35.00 X 34.42	0.00 X 0.42	Vernier	PASS
F	±0.50	40 x 7.5	40.38 X 7.5	0.38 X 0.00	Vernier	PASS
G	±0.50	40 x 72.50	40.48 X 72.70	0.48 X 0.20	Vernier	PASS
H	±0.50	49 x 40	49.02 X 40.20	0.02 X 0.20	Vernier	PASS
I	±0.50	60 x7.5	60.22 X 7.52	0.22 X 0.02	Vernier	PASS
J	±0.50	60 x 72.5	60.18 X 72.58	0.18 X 0.08	Vernier	PASS
K	±0.50	61 x 49	61.28 X 49.18	0.28 X 0.18	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.03mm	0.03	DTI & Datum table	PASS

Drill Jig Front Support Block

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	80	80.48	0.48	Vernier	PASS
Material width	±0.50	15	15.22	0.22	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						
A	±0.50	20 x 10	20.24 X 10.08	0.24 X 0.08	Vernier	PASS
B	±0.50	60 x 10	60.24 X 9.98	0.24 X 0.02	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.05	0.5	DTI & Datum table	PASS

Drill Jig Side Support Block

Components Dimensions	Tolerance (mm)	Required Size(mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	40	40.10	0.10	Vernier	PASS
Material width	±0.50	15	15.10	0.10	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						
A Part 1	±0.50	10 x 7.5	10.24 X 7.56	0.24 X 0.06	Vernier	PASS
B Part 1	±0.50	30 x 7.5	30.38 X 7.50	0.38 X 0.00	Vernier	PASS
A Depth Part 1	±0.50	8	8.40	0.4	Vernier	PASS
B Depth Part 1	±0.50	8	8.32	0.32	Vernier	PASS
A Part 2	±0.50	10 x 7.5	10 X 7.62	0.00 X 0.12	Vernier	PASS
B Part 2	±0.50	30 x 7.5	30.28 X 7.52	0.28 X 0.02	Vernier	PASS
A Depth Part 2	±0.50	8	8.28	0.28	Vernier	PASS
B Depth Part 2	±0.50	8	8.12	0.12	Vernier	PASS
C Part 1	±0.50	20 x 5	20.28 X 4.88	0.28 X 0.12	Vernier	PASS
C Part 2	±0.50	20 x 5	20.02 X 4.92	0.02 X 0.08	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.04	0.04	DTI & datum table	PASS

Drill Jig Top

Components Dimensions	Tolerance	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	75	75.12	0.12	Vernier	PASS
Material width	±0.50	60	60.08	0.08	Vernier	PASS
Material thickness	±0.50	10	9.96	0.04	Vernier	PASS
Hole Positions						
A	±0.50	10 x 10	10.20 x 10.02	0.20 x 0.02	Vernier	PASS
B	±0.50	10 x 50	10.04 x 50.36	0.04 x 0.36	Vernier	PASS
C	±0.50	22 x 15	15.04 x 22.02	0.04 x 0.02	Vernier	PASS
D	±0.50	22 x 45	45.14 x 21.98	0.14 x 0.02	Vernier	PASS
E	±0.50	35 x 24	34.98 x 24.02	0.02 x 0.02	Vernier	PASS
F	±0.50	49 x 30	48.78 x 29.76	0.22 x 0.24	Vernier	PASS
G	±0.50	61 x 39	61.24 x 39.28	0.24 x 0.28	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.02	0.2	DTI & datum table	PASS

Comments

Appearance/defects - Some minor surface marks, could remove these with a more thorough polish.

One side support sitting proud, does not affect performance. I'd suggest tightening up the overall tolerances, reducing them to prevent any future errors if the tolerances are not met.

Functionality – Drill jig works well, sample part successful.

3a. Practical observation form – Quality review

Assessment ID	Qualification number
8713-331	8713-331
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Quality review and evaluation

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes** – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Quality inspection and application of measuring equipment Functionality	The candidate put on their PPE and prepared their work area. Measuring tools were checked and calibrated before use. Completed visual inspection of the drill jig assembly, checking surface finish. Disassembled the drill jig assembly using hand tools, checks made for each of the components against the specification and drawings. The correct measuring equipment was selected when measuring each part. Dimensional checks carried out; all findings recorded on the quality check sheet. All tolerances within the specification were met. Measurements were taken with a high level of accuracy. Candidate referred back to the technical information to confirm the tolerance. Re-assembled the components in the correct sequence to form the drill jig assembly. Functionality of the jig tested by producing a sample part. The sample part was checked for accuracy. The sample part passed inspection. All defects identified and solutions offered. Minor surface defect (residual tool mark) and one side support sat slightly proud, did not affect the operation of the assembly or go outside the specified tolerances. The candidate suggested that the overall tolerances on the jig should be tightened to reduce the chance of error.

Assessor signature	**Date**
Assessor A	**18.12.2021**

Commentary

Note: This commentary includes completion of the quality check form

The observation evidence has captured that the candidate undertook a thorough quality inspection of the machined drill jig assembly components and complete assembly.

They utilised appropriate measuring equipment to perform the checks on each of the components to record the final dimensions and to check for compliance with tolerances against the brief. The candidate correctly calibrated the measuring equipment before use.

The candidate performed dimensional checks, a functionality check and a surface check for defects, recording their findings on their quality check sheet. The completed quality check sheet could then be utilized within their quality inspection report.

All dimensions and components were checked for accuracy against the dimensions and tolerances in the given specification and recorded. All dimensions were within the given tolerances.

All detectable surface defects were identified, recorded and attributed to a process or procedural deficiency, for example, some residual tool marks and one side support sitting slightly proud. The candidate recorded rectification processes on their quality check sheet. The candidate has utilised the quality check sheet template from task 1 and has made no changes to the form showing a good understanding of planning and what is required for a quality check. The check sheet contains a comprehensive level of information, is set out clearly and shows the candidate has recorded the findings and provided additional observations from their quality inspection.

The candidate also identified a procedural issue with the tolerances given in the specification, showing a thorough understanding of how the setting of tolerances can cause unintended errors within the production process if not adhered to.

Task 3b – Evaluation and recording

(Assessment themes: Health and safety, Quality review and evaluation (quality review, reporting, recording and handover)

For task 3b, candidates need to produce the following piece of evidence:

- completed quality inspection report.

Candidate evidence

3b. Quality inspection report

Quality Inspection Report

Introduction

The assignment was to create a drill jig to drill to enable a number of spaced holes to be quickly and accurately during the manufacturing process for a batch of new components ensuring a more efficient production, with fewer rejected components and reduction in machine time. Technical drawings were produced by the design department. Materials were specified in the brief. On completion of the production of the drill jig assembly, a sample part was to be produced, inspected and quality tested.

Production process

The components were manufactured using low carbon mild steel plate which was cut to size and checked for squareness. Flatness was checked using a dial test indicator gauge, high points were removed with a file. Standard marking out procedures were used to mark up the placement of the drill holes as per the technical drawings, this included using centre lines and adding centre dots before drilling using a pillar drill. In-production checks were carried out to check the positioning of the holes was accurate and the positioning of the drill bit to the centre dot, prior to drilling. The completed components were assembled, secured together using pre-manufactured bolts and dowels. A sample part was created using the drill jig to check the accuracy of the drill jig assembly. Waste was minimised and disposed of in accordance with waste regulations and workshop procedures. No problems were encountered during the production process.

Product testing and inspection

I carried out a full quality inspection on the completed drill jig assembly. This consisted of carrying out a visual inspection, performing checks for dimensional accuracy and testing the sample part using the drill jig to test the overall functionality and accuracy.

I prepared my work area checking it was clean and free of debris to ensure the drill jig was not damaged by any debris from a previous job. I selected a digital Vernier calliper to accurately measure the dimensions of the individual components and compare them to the requirements of the technical drawings contained in the brief. The Vernier calliper was checked, cleaned and calibrated to ensure the readings taken were accurate. I collected a selection of hand tools to disassemble the drill jig.

I completed a visual inspection on the completed drill jig assembly. This was carried out in a room with good lighting. The surface of the drill jig had some minor surface marks which had not been totally removed through polishing but the overall appearance was good. One supporting side was sitting slightly proud but this did not affect the overall performance.

I used hand tools to carefully disassemble the drill jig assembly to carry out dimensional checks on the individual component parts which consisted of the base plate, front support block, side support blocks and the top plate. Using the Vernier I measured each component, measuring accurately to determine the finished dimensions and recorded the readings on the quality check sheet. I repeated this process for each component part. I referred back to the brief and the technical drawings to confirm the required tolerances. All components were within the tolerances given and conform to the dimensional requirements of the brief and technical drawings. There were no concessions.

I used the quality check sheet to record my final dimensions and to capture my observations. A copy of my quality check sheet is included below:

Drill Jig Base

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	100	100.00	0.00	Vernier	PASS
Material width	±0.50	80	80.24	0.24	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						
A	±0.50	10 x 20	10.22 X 20.22	0.22 X 0.22	Vernier	PASS
B	±0.50	10 x 60	10.24 X 60.20	0.24 X 0.20	Vernier	PASS
C	±0.50	22 x 25	21.72 X 24.82	0.28 X 0.18	Vernier	PASS
D	±0.50	22 x 55	22.02 X 54.76	0.02 X 0.24	Vernier	PASS
E	±0.50	35 x 34	35.00 X 34.42	0.00 X 0.42	Vernier	PASS
F	±0.50	40 x 7.5	40.38 X 7.5	0.38 X 0.00	Vernier	PASS
G	±0.50	40 x 72.50	40.48 X 72.70	0.48 X 0.20	Vernier	PASS
H	±0.50	49 x 40	49.02 X 40.20	0.02 X 0.20	Vernier	PASS
I	±0.50	60 x7.5	60.22 X 7.52	0.22 X 0.02	Vernier	PASS
J	±0.50	60 x 72.5	60.18 X 72.58	0.18 X 0.08	Vernier	PASS
K	±0.50	61 x 49	61.28 X 49.18	0.28 X 0.18	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.03mm	0.03	DTI & Datum table	PASS

Drill Jig Front Support Block

Components Dimensions	Tolerance (mm)	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	80	80.48	0.48	Vernier	PASS
Material width	±0.50	15	15.22	0.22	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						
A	±0.50	20 x 10	20.24 X 10.08	0.24 X 0.08	Vernier	PASS
B	±0.50	60 x 10	60.24 X 9.98	0.24 X 0.02	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.05	0.5	DTI & Datum table	PASS

Drill Jig Side Support Block

Components Dimensions	Tolerance (mm)	Required Size(mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	40	40.10	0.10	Vernier	PASS
Material width	±0.50	15	15.10	0.10	Vernier	PASS
Material thickness	±0.50	10	9.98	0.02	Vernier	PASS
Hole Positions						

A Part 1	±0.50	10 x 7.5	10.24 X 7.56	0.24 X 0.06	Vernier	PASS
B Part 1	±0.50	30 x 7.5	30.38 X 7.50	0.38 X 0.00	Vernier	PASS
A Depth Part 1	±0.50	8	8.40	0.4	Vernier	PASS
B Depth Part 1	±0.50	8	8.32	0.32	Vernier	PASS
A Part 2	±0.50	10 x 7.5	10 X 7.62	0.00 X 0.12	Vernier	PASS
B Part 2	±0.50	30 x 7.5	30.28 X 7.52	0.28 X 0.02	Vernier	PASS
A Depth Part 2	±0.50	8	8.28	0.28	Vernier	PASS
B Depth Part 2	±0.50	8	8.12	0.12	Vernier	PASS
C Part 1	±0.50	20 x 5	20.28 X 4.88	0.28 X 0.12	Vernier	PASS
C Part 2	±0.50	20 x 5	20.02 X 4.92	0.02 X 0.08	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.04	0.04	DTI & datum table	PASS

Drill Jig Top

Components Dimensions	Tolerance	Required Size (mm)	Actual Size (mm)	Error (mm)	Instrument Used	Result
Material length	±0.50	75	75.12	0.12	Vernier	PASS
Material width	±0.50	60	60.08	0.08	Vernier	PASS
Material thickness	±0.50	10	9.96	0.04	Vernier	PASS
Hole Positions						
A	±0.50	10 x 10	10.20 x 10.02	0.20 x 0.02	Vernier	PASS
B	±0.50	10 x 50	10.04 x 50.36	0.04 x 0.36	Vernier	PASS
C	±0.50	22 x 15	15.04 x 22.02	0.04 x 0.02	Vernier	PASS
D	±0.50	22 x 45	45.14 x 21.98	0.14 x 0.02	Vernier	PASS
E	±0.50	35 x 24	34.98 x 24.02	0.02 x 0.02	Vernier	PASS
F	±0.50	49 x 30	48.78 x 29.76	0.22 x 0.24	Vernier	PASS
G	±0.50	61 x 39	61.24 x 39.28	0.24 x 0.28	Vernier	PASS
Surface Finish	±0	1.6 µm	1.6	0	Comparison gauge	PASS
Flatness	±.05	0	0.02	0.2	DTI & datum table	PASS

Comments

Appearance/defects - Some minor surface marks, could remove these with a more thorough polish.

One side support sitting proud, does not affect performance. I'd suggest tightening up the overall tolerances, reducing them to prevent any future errors if the tolerances are not met.

Functionality – Drill jig works well, sample part successful.

Evaluation

Whilst I had met all the tolerances for the components for the drill jig, I would ensure if I was to remake this drill jig that I made the components closer to the measurement because, even though the measurement was within the plus or minus 0.50mm, I feel that that was a large tolerance and I should have got most of my measurements within 0.25mm.

In order to improve if I was to carry out this task again, I would ensure I measure the components more often as I am producing the component to ensure I am working towards the correct dimensions. I would also work on improving centre dotting the hole centres. As with the centre dot most of the holes were in the correct tolerance, however, they could have been closer to the centre therefore I will need to work on centre dot and centre punching holes to ensure I can produce a component as close to the dimension as possible. This attention to accuracy would also ensure all the components were flush.

I was happy with the surface finish I was able to achieve, however, I could have taken the time to remove all of the mill scale off of the workpiece to ensure the best surface finish I could get.

Conclusion

The design of the drill jig is good and would be suitable for the purpose it was intended for.

To improve production performance, I would suggest to the design department that all tolerances are tightened. This is because the generous tolerances that were given could cause compound error between the positioning of the holes on the top plate and those on the bottom plate, even if the holes are produced to the current tolerances. If the holes are not aligned correctly the jig will not perform with the required accuracy. If the tolerances were halved the chance of producing a compound error would be greatly reduced and potential waste would be reduced.

Overall, I am happy with how the job has turned out as all of the holes were in alignment and the sample part was created with accuracy, proving the functionality of the drill jig.

Commentary

The candidate has given a comprehensive description of the methods and techniques undertaken to produce the drill jig assembly and the process of performing the quality testing.

Evaluation is thorough and the candidate has identified a comprehensive range of improvements to their own performance and has provided a suggestion to improve the design and manufacturing process. For example, the candidate has identified that they would like to improve their accuracy, namely when placing centre dots and punching the holes before they are drilled with the intention to be closer to the required dimension.

The candidate has also identified where the given tolerances are too generous and by providing the wide tolerance, a compound error could arise between the hole alignment of the top and bottom plates. They have suggested to halve the given tolerance to reduce the chance of creating the error. This shows a comprehensive understanding of the need to adhere to tolerances and how tolerances can affect the end product.

The report contains accurate information and the correct industry terminology has been used throughout the report. The report is laid out correctly with an overview of the given task, an overview of the production process undertaken, an account of the processes taken during the quality testing and has evaluated their performance. The candidate has concluded the report with their suggestions for process improvements. The inclusion of the completed quality check sheet gives the finished sizes of the components and has captured the key data showing whether the component met the required dimensions.

Task 3c – Handover meeting

(Assessment themes: Health and safety, Quality review and evaluation (quality review, reporting, recording and handover)

For task 3c, candidates must produce the following materials:

- completed drill jig assembly (from task 2)
- sample drilled part (from task 3a)
- quality inspection report (from task 3b).

For task 3c, assessors will need to produce the following pieces of supporting evidence:

- assessor observation:
    - handover meeting.

Video evidence

- video evidence showing the handover meeting.

The following task 3c supporting evidence has not been included for this version of the GSEM:

Video evidence

- video evidence showing the handover meeting.

3c. Practical observation form – Handover meeting

Assessment ID	Qualification number
8713-331	8713-331
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Quality review and evaluation

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes** – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Handover meeting	The candidate explained their given brief and justified the methods of marking-out procedures and methods used to produce the components. They showed a comprehensive knowledge of all the operating procedures to manufacture the parts needed to make up the drill jig assembly, detailing how they checked the alignment of the drill to the punched marks to assure accuracy before drilling the final holes. They explained the benefits of the drill jig assembly. They referred back to the engineering drawing, tolerances and quality procedure throughout the meeting to confirm or reiterate points made. They explained how they could make improvements if they were to do this again, explaining a closer adherence to tolerances and a cleaner surface polish. The candidate suggested that the overall given tolerances could be made tighter as there was a risk that if some tolerances were missed whilst making the components then there is a higher risk of alignment issues, by bringing the tolerances down this may be avoided. They presented the completed drill jig assembly, the sampled drilled part and their quality inspection report. They also supplied their completed quality check sheet. They used correct terminology throughout and referred to the adherence and meeting of safety regulations and industry standards showing a very good understanding of the subject area. They conducted themselves with professionalism whilst in the handover meeting.

Assessor signature	**Date**
Assessor A	**18.12.2021**

Commentary

The observation evidence details the candidate undertook a comprehensive handover. The account indicates the candidate had shown comprehensive subject knowledge and understanding in accurately describing in detail the processes undertaken. For example, the candidate describing how they set up the drill to check the alignment prior to drilling the final holes to ensure accuracy.

They provided explanations for the defects and gave a thorough evaluation of where improvements could be made. For example, the candidate identified a problem with the overall tolerances given in the specification, namely if some tolerances were off during the production of the components there is a likelihood that mis-alignment could arise even if the components are to near tolerance. This demonstrates a thorough understanding of the production process and the importance of being accurate and meeting tolerances.

The evidence states that the candidate demonstrated very good communication skills, presented themselves professionally and used the correct industry terminology at the appropriate level throughout.

The T Level is a qualification approved and managed by the Institute for Apprenticeships and Technical Education.