



ETCAL Level 2 NVQ Diploma in Mechanical Manufacturing
Engineering
600/2653/4
Assessment

Diploma - Assessment Principles

Introduction

ETA qualifications are developed in conjunction with the industries and employers they service. They are designed to add value and deliver multidimensional outputs that provide impact for both learners and employers.

It is therefore important that the assessment requirements of ETA qualifications are robust whilst not containing unnecessary and over-burdensome challenges that detract from the intended outcomes and impact. These assessment principles are prepared with that in mind and are applicable to this qualification:

Level 2 NVQ Diploma in Mechanical Manufacturing Engineering

Principles

There are four key principles to underpin assessment delivery:

1. Assessment should contribute to developing a learner's knowledge and/or skills and provide relevant and current development as the related industry requires.
2. Systems for capturing evidence of competence should be integrated and efficient. Assessment practices for both competence-based and knowledge-based aspects of qualifications should, where possible, be integrated with industry driven standards and requirements.
3. Assessment methods must be appropriate for the level and nature of the qualification units to be assessed. Methods of assessing achievement against learning outcomes and assessment principles must be accommodating and flexible, whilst remaining appropriate for both the level being assessed and industry expectations of learners at that level.
4. Evidence of knowledge and understanding must be recorded and be clearly attributable to the learner. This can be delivered using task based activity with questions and answer sessions, supported by assessor observation.

The choice and application of assessment methods must be consistent with these principles and will generally include:

- Direct Observation
- Written evidence (portfolio/workbook)
- Centre set assignment
- Centre set coursework
- Oral examination
- Professional/open discussion

Delivery Team Requirements

Tutors / Assessors

- Tutors / Assessors should have a detailed knowledge of, and be competent in, the occupational requirements of the units
- Tutors / Assessors should hold or be working towards the related professional qualifications for delivery and assessment as required
- This competence will have been acquired either in direct employment in the occupational role to which the unit relates, or in employment as a manager, supervisor or in-house trainer of employees carrying out the role
- It is unlikely that occupational competence will have been achieved in less than twelve months of employment but individuals with less experience could be considered as assessors if sufficiently occupationally competent

Internal Quality Assurers (IQAs)

- IQAs must have a thorough understanding of the structure, content and occupational requirements of the units that they are internally quality assuring. This understanding will have been acquired while either working directly within or delivering within the relevant occupational area in either an operational or a support function
- The level of understanding must be sufficient to allow the IQA to judge whether the assessor has fully assessed learners against all the principles within the unit
- It is unlikely that a person could have gained this level of understanding in less than twelve months of being employed but individuals with less experience could be considered as IQAs if they have the required level of experience, knowledge and understanding.

Technical / Expert Witness

Expert witnesses can be drawn from a wide range of people who can observe, 'measure and examine performance against the industry and qualification principles. These can include line managers and experienced individuals within a related sector-based organisation. The Technical Expert Witnesses should have proven practical experience and knowledge relating to the content of the principles being assessed.

It is unlikely that someone could become an expert in their entire job role in less than twelve months of being employed in their industry. They could, however, very quickly become an expert in the content of a single unit if this was the focus of their job role. The assessor should make a

judgement as to the level of expertise held by a potential Technical Expert Witness and, where necessary, this should be confirmed with the awarding organisation.

Assessment Materials

ETC Awards Ltd. (ETA) Assessment Materials are protected by copyright and are supplied only to Approved Centres for use solely for the purpose of the assessment of ETA learners.

Instructions for Conducting Assessment

the Approved Centre must either:

- secure approval of in-house assessment material by ETA's External Quality Assurance team prior to use
- use ETA Assessment Materials
- we recognise that reasonable adjustments may be considered at the time of assessment, please refer to the ETA Reasonable adjustments and considerations policy

All approved centres must then handle and store securely all Assessment Materials in accordance with the following:

- Assessment Material must be accessible to learners only during their programme
- The Approved Centre must not make public in any format the contents of any materials either in part or in full.
- Materials must be securely handled and under no circumstances shared with third party organisations or individuals
- The Approved Centre must seek permission from ETA through the External Quality Assurance team if they want to convert Material for alternative storage, retrieval and delivery in electronic formats.

All centre based assessment material must be agreed with ETA prior to use and will be subject to robust monitored during sampling and verification activity.



Level 2 Unit – Complying with Statutory Regulations and Organisational Safety Requirements

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.

The learner will be expected to comply with all relevant regulations that apply to their area of work, as well as their general responsibilities as defined in the Health and Safety at Work Act. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.

The learner will also be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

Unit introduction

The learner's responsibilities will require them to comply with all relevant statutory and organisational policy and procedures for health and safety in the workplace. The learner must act in a responsible and safe manner at all times and present themselves in the workplace suitably prepared for the activities to be undertaken. The learner will be expected to report any problems with health and safety issues, to the relevant authority.

The learner's knowledge will provide a good understanding of the relevant statutory regulations and organisational requirements associated with their work and will provide an informed approach to the procedures used. The learner will need to understand their organisation's health and safety requirements and their application, in adequate depth to provide a sound basis for carrying out their activities in a safe and competent manner.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		A/601/5013
Qualification Framework		RQF
Title		Complying with statutory regulations and organisational safety requirements
Unit Level		Level 2
Guided Learning Hours		35
Unit Credit Value		5
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Complying with statutory regulations and organisational safety requirements	1.1	Comply with their duties and obligations as defined in the Health and Safety at Work Act	
		1.2	Demonstrate their understanding of their duties and obligations to health and safety by: <ul style="list-style-type: none"> • applying in principle their duties and responsibilities as an individual under the Health and Safety at Work • identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: <ul style="list-style-type: none"> • eye protection and personal protective equipment (PPE) • COSHH regulations • risk assessments • identifying the warning signs and labels of the main groups of hazardous or dangerous substances • complying with the appropriate statutory regulations at all times 	
		1.3	Present themselves in the workplace suitably prepared for the activities to be undertaken	
		1.4	Follow organisational accident and emergency procedures	
		1.5	Comply with emergency requirements, to include: <ul style="list-style-type: none"> • identifying the appropriate qualified first aiders and the location of first aid facilities • identifying the procedures to be followed in the event of injury to themselves or others 	

		<ul style="list-style-type: none"> • following organisational procedures in the event of fire and the evacuation of premises • identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment 	
1.6		Recognise and control hazards in the workplace	
1.7		Identify the hazards and risks that are associated with the following: <ul style="list-style-type: none"> • their working environment • the equipment that they use • materials and substances (where appropriate) that they use • working practices that do not follow laid down procedures 	
1.8		Use correct manual lifting and carrying techniques	
1.9		Demonstrate one of the following methods of manual lifting and carrying: <ul style="list-style-type: none"> • lifting alone • with assistance of others • with mechanical assistance 	
1.10		Apply safe working practices and procedures to include: <ul style="list-style-type: none"> • maintaining a tidy workplace, with exits and gangways free from obstruction • using equipment safely and only for the purpose intended • observing organisational safety rules, signs and hazard warnings • taking measures to protect others from any harm resulting from the work that they are carrying out 	



Level 2 Unit – Using and Interpreting Engineering Data
and Documentation

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. They will be expected to report any problems with the use and interpretation of the documents that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions if necessary, with an appropriate level of supervision or as a member of a team and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's underpinning knowledge will provide a good understanding of the types of documentation used and will provide an informed approach to applying instructions and procedures. They will be able to read and interpret the documentation used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		Y/601/5012
Qualification Framework		RQF
Title		Using and interpreting engineering data and documentation
Unit Level		Level 2
Guided Learning Hours		25
Unit Credit Value		5
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Using and interpreting engineering data and documentation	1.1	Use the approved source to obtain the required data and documentation	
		1.2	Use the data and documentation and carry out all of the following: <ul style="list-style-type: none"> • check the currency and validity of the data and documentation used • exercise care and control over the documents at all times • correctly extract all necessary data in order to carry out the required tasks • seek out additional information where there are gaps or deficiencies in the information obtained • deal with or report any problems found with the data and documentation • make valid decisions based on the evaluation of the engineering information extracted from the documents • return all documents to the approved location on completion of the work • complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation 	
		1.3	Correctly identify, interpret and extract the required information	
		1.4	Extract information that includes three of the following: <ul style="list-style-type: none"> • materials or components required • dimensions • tolerances • build quality • installation requirements • customer requirements • time scales 	

		<ul style="list-style-type: none"> • financial information • operating parameters • surface texture requirements • location/orientation of parts • process or treatments required • dismantling/assembly sequence • inspection/testing requirements • number/volumes required • repair/service methods • method of manufacture • weld type and size • operations required • connections to be made • surface finish required • shape or profiles • fault finding procedures • safety/risk factors • environmental controls • specific data (such as component data, maintenance data, electrical data, fluid data) • resources (such as tools, equipment, personnel) • utility supply details (such as electricity, water, gas, air) • location of services, including standby and emergency backup systems • circuit characteristics (such as pressure, flow, current, voltage, speed) • protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment) • other specific related information 	
	1.5	Use the information obtained to ensure that work output meets the specification	
	1.6	<p>Use information extracted from documents to include one from the following:</p> <ul style="list-style-type: none"> • drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings) • diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams) • manufacturers manuals/drawings • approved sketches • technical illustrations • photographic representations • visual display screen information 	

		<ul style="list-style-type: none"> • technical sales/marketing documentation • contractual documentation • other specific drawings/documents 	
	1.7	<p>Use information extracted from related documentation, to include two from the following:</p> <ul style="list-style-type: none"> • instructions (such as job instructions, drawing instructions, manufacturers instructions) • specifications (such as material, finish, process, contractual, calibration) • reference materials (such as manuals, tables, charts, guides, notes) • schedules • operation sheets • service/test information • planning documentation • quality control documents • company specific technical instructions • national, international and organisational standards • health and safety standards relating to the activity (such as COSHH) • other specific related documentation 	
	1.8	Deal promptly and effectively with any problems within their control and report those which cannot be solved	
	1.9	Report any inaccuracies or discrepancies in documentation and specifications	



Level 2 Unit – Carrying out engineering activities efficiently and effectively

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

On completion of the engineering activity, the learner will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.

In order to be efficient and effective in the workplace, the learner will also be required to demonstrate that they can create and maintain effective working relationships with colleagues and line management. The learner will also be expected to review objectives and targets for their personal development and make recommendations to, and communicate any opportunities for, improvements that could be made to working practices and procedures.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, or the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work and will provide an informed approach to working efficiently and effectively in an engineering environment. The learner will understand the need to work efficiently and effectively, and will know about the areas they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

The learner will understand the safety precautions required when carrying out engineering activities. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		Y/601/5052
Qualification Framework		RQF
Title		Carrying out engineering activities efficiently and effectively
Unit Level		Level 2
Guided Learning Hours		25
Unit Credit Value		5
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Carrying out engineering activities efficiently and effectively	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Prepare the work area to carry out the engineering activity	
		1.3	Prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken: <ul style="list-style-type: none"> • the work area is free from hazards and suitably prepared for the activities to be undertaken • any required safety procedures are implemented • any necessary personal protection equipment is obtained and is in a usable condition • tools and equipment required are obtained and checked that they are in a safe and useable condition • all necessary drawings, specifications and associated documentation is obtained • job instructions are obtained and understood • the correct materials or components are obtained • storage arrangements for work are appropriate • appropriate authorisation to carry out the work is obtained 	
		1.4	Check that there are sufficient supplies of materials and/or consumables and that they meet work requirements	
		1.5	Ensure completed products or resources are stored in the appropriate location on completion of the activities	

		1.6	<p>Complete work activities, to include all of the following:</p> <ul style="list-style-type: none"> • returning tools and equipment • returning drawings and work instructions • completing all necessary documentation accurately and legibly • identifying, where appropriate, any unusable tools, equipment and components • arranging for the safe disposal of waste materials 	
		1.7	Tidy up the work area on completion of the engineering activity	
		1.8	Deal promptly and effectively with problems within their control and report those that cannot be resolved	
		1.9	<p>Deal with problems affecting the engineering process, to include two of the following:</p> <ul style="list-style-type: none"> • materials • tools and equipment • drawings • job specification • quality • people • timescales • safety • activities or procedures 	
		1.10	<p>Contribute to organisational procedures for identifying opportunities for improvement to one of the following:</p> <ul style="list-style-type: none"> • working practices • working methods • quality • safety • tools and equipment • supplier relationships • internal communication • customer service • training and development • teamwork • other 	

	1.11	Maintain effective working relationships with colleagues to include two of the following: <ul style="list-style-type: none">• colleagues within their own working group• people outside their normal working group• line management• external contacts	
	1.12	Review personal training and development as appropriate to the job role	
	1.13	Review personal development objectives and targets to include one of the following: <ul style="list-style-type: none">• dual or multi-skilling• training on new equipment/technology• increased responsibility• understanding of company working practices, procedures, plans and policies• other specific requirements	



Level 2 Unit – Operating Centre Lathes

Unit aim

This unit covers the skills and knowledge needed to prove the competences required for carrying out turning operations on a centre lathe, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components, materials and consumables are available. The learner will be expected to produce a range of components that combine a number of different features, such as parallel, stepped and tapered diameters, drilled, bored and reamed holes, internal and external threads.

The learner will be required to operate the machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying centre lathe machining procedures. The learner will have an understanding of the centre lathe turning process, and its application, and will know about the equipment, materials and consumables, in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine and its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

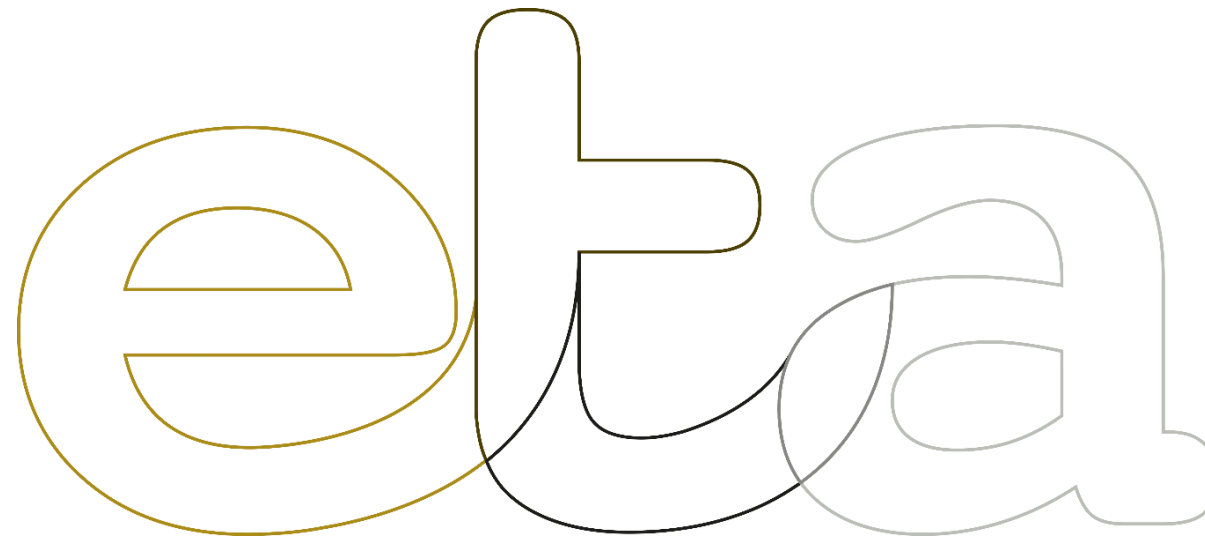
Unit Reference Number		A/600/5419
Qualification Framework		RQF
Title		Operating Centre Lathes
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating Centre Lathes	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the machine is set up and ready for the machining activities to be carried out	
		1.3	Manipulate the machine tool controls safely and correctly in line with operational procedures	
		1.4	Produce components to the required quality and within the specified dimensional accuracy	
		1.5	Apply all of the following during the machining activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.6	Produce machined components which combine different operations and cover six of the following:	

		<ul style="list-style-type: none"> • flat faces • parallel diameters • stepped diameters • tapered diameters • drilled holes • bored holes • reamed holes • profile forms • internal threads • external threads • eccentric features • parting off • chamfers • knurls or special finishes • grooves • undercuts 	
	1.7	<p>Machine components made from one of the following types of material:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
	1.8	<p>Produce components with dimensional accuracy, form and surface texture within all of the following quality and accuracy standards, as is applicable to the operations performed:</p> <ul style="list-style-type: none"> • components to be free from false tool cuts, burrs and sharp edges • dimensional tolerance equivalent to BS 4500 or BS 1916 Grade 7 • surface finish 63 μin or 1.6μm • reamed or bored holes within H8 • screw threads BS medium fit • angles within +/- 1degree 	
	1.9	Carry out quality sampling checks at suitable intervals	
	1.10	<p>Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of four of the following:</p> <ul style="list-style-type: none"> • diameters • hole size/fit • surface finish • angle/taper • thread fit • lengths • depths • grooves/undercut 	

		1.11	Deal promptly and effectively with problems within their control and report those that cannot be solved	
		1.12	Shut down the equipment to a safe condition on conclusion of the machining activities	
2.	Know how to Operate Centre Lathes	2.1	Describe the safe working practices and procedures to be followed whilst operating centre lathes	
		2.2	Describe the safety mechanisms on the machine, and the procedure for checking that they function correctly	
		2.3	Describe the operation of the machine controls in both hand and power modes	
		2.4	Explain how to stop the machine in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the hazards associated with operating centre lathes and carrying out the turning operations, and how to minimise them and reduce any risks	
		2.7	Describe the importance of keeping the work area clean and tidy	
		2.8	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.9	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards in relation to work undertaken)	
		2.10	Explain how to use imperial and metric systems of measurement	
		2.11	Describe the main features of the centre lathes and the accessories that can be used (such as saddle, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies)	
		2.12	Describe the various turning operations that can be performed, and the methods and equipment used	
		2.13	Describe the effects of backlash in machine slides and screws, and how this can be overcome	
		2.14	Describe the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy	
		2.15	Describe the application of cutting fluids with regard to a range of different materials	
		2.16	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
		2.17	Explain how to recognise machining faults and how to identify when tools need re-sharpening	
		2.18	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
		2.19	Describe the problems that can occur with the turning activities, and how these can be overcome	

		2.20	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	
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Level 2 Unit – Operating Milling Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out milling operations on a milling machine, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. The learner will be expected to produce a range of components that combine a number of different features, such as flat faces, parallel faces, faces that are flat and square to each other, angular faces, steps, slots and special forms.

The learner will be required to operate the machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying procedures for milling machining. The learner will have an understanding of the milling machine process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		T/600/5435
Qualification Framework		RQF
Title		Operating Milling Machines
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating Milling Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the machine is set up and ready for the machining activities to be carried out	
		1.3	Manipulate the machine tool controls safely and correctly in line with operational procedures	
		1.4	Produce components to the required quality and within the specified dimensional accuracy	
		1.5	Apply all of the following during the machining activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.6	Operate one type of milling machine from the following: <ul style="list-style-type: none"> • horizontal milling machine • vertical milling machine 	

		<ul style="list-style-type: none"> • universal milling machine 	
	1.7	<p>Produce machined components which combine different operations and cover six of the following:</p> <ul style="list-style-type: none"> • flat faces • square faces • parallel faces • angular faces • steps/shoulders • open ended slots • enclosed slots • recesses • tee slots • drilled holes • bored holes • profile forms (such as vee, concave, convex, gear forms) • serrations • indexed or rotated forms • special forms 	
	1.8	<p>Machine components made from one of the following types of material:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
	1.9	<p>Produce components with dimensional accuracy, form and surface texture within all the following quality and accuracy standards, as is applicable to the operations performed:</p> <ul style="list-style-type: none"> • components to be free from false tool cuts, burrs and sharp edges • dimensional tolerance equivalent to BS 4500 or BS 1916 Grade 9 • flatness and squareness within 0.005" per inch or 0.125mm per 25mm • surface finish 63µin or 1.6µm • angles within +/- 1 degree 	
	1.10	Carry out quality sampling checks at suitable intervals	
	1.11	<p>Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of four of the following:</p> <ul style="list-style-type: none"> • dimensions • squareness • hole size/fit • angles • flatness • surface finish • slots 	

			<ul style="list-style-type: none"> recesses 	
		1.12	Deal promptly and effectively with problems within their control and report those that cannot be solved	
		1.13	Shut down the equipment to a safe condition on conclusion of the machining activities	
2.	Know how to Operate Milling Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating milling machines	
		2.2	Describe the safety mechanisms on the machine, and the procedure for checking that they function correctly	
		2.3	Describe the operation of the machine controls in both hand and power modes, and how to stop the machine in an emergency	
		2.4	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.5	Describe the hazards associated with operating milling machines and carrying out the milling operations, and how to minimise them and reduce any risks	
		2.6	Describe the importance of keeping the work area clean and tidy	
		2.7	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.8	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards in relation to work undertaken)	
		2.9	Explain how to use imperial and metric systems of measurement	
		2.10	Describe the main features of the milling machine, and the accessories that can be used	
		2.11	Describe the various milling operations that can be performed, and the methods and equipment used	
		2.12	Describe the effects of backlash in machine slides and screws, and how this can be overcome	
		2.13	Explain how to handle and store cutting tools safely and correctly	
		2.14	Describe the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy	
		2.15	Describe the application of cutting fluids with regard to a range of different materials	
		2.16	Describe the effects of clamping the workpiece, and how this can cause distortion in the finished components	
		2.17	Explain how to recognise machining faults, and how to identify when cutters need re-sharpening	
		2.18	Describe the quality control procedures that are used, inspection checks to be carried out, and the equipment that will need to be used	
		2.19	Describe the problems that can occur with the milling activities, and how these can be overcome	

		2.20	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	
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A large, stylized version of the 'eta' logo. The 'e' is gold, the 't' is black, and the 'a' is grey. The letters are thick and rounded, with a slight overlap between the 't' and 'a'.

Level 2 Unit – Operating Grinding Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out grinding operations, using machines such as horizontal or vertical surface grinding, external cylindrical, internal cylindrical, centreless, profile or thread grinding machines, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. The learner will be expected to grind a range of components that combine a number of different features, such as parallel faces, flat faces, vertical faces, parallel, diameters, stepped diameters, tapered diameters, shoulders and faces, bores and counterbores, different thread forms and profiles.

The learner will be required to operate the machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying grinding procedures. The learner will have an understanding of the grinding machine used, the grinding process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		H/600/5446
Qualification Framework		RQF
Title		Operating Grinding Machines
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating Grinding Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the machine is set up and ready for the machining activities to be carried out	
		1.3	Manipulate the machine tool controls safely and correctly in line with operational procedures	
		1.4	Produce components to the required quality and within the specified dimensional accuracy	
		1.5	Apply all of the following during the machining activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that grinding wheels are maintained correctly dressed/formed and are in a usable condition • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	

		<p>1.6 Operate one of the following types of grinding machine:</p> <ul style="list-style-type: none"> • horizontal surface • vertical surface • external cylindrical • internal cylindrical • universal • centreless • thread grinding • profile grinding 	
		<p>1.7 Produce ground components which include three of the following features, as applicable to the type of machine used:</p> <ul style="list-style-type: none"> • flat faces • vertical faces • parallel faces • faces square to each other • shoulders and faces • slots • parallel diameters • tapered diameters • counterbores • tapered bores • parallel bores • profile forms • other thread forms • vee-form threads • left hand threads • right hand threads • single start threads • multi-start threads • internal threads • external threads • angular faces 	
		<p>1.8 Produce components with dimensional accuracy, form and surface texture within all the following standards as is applicable to the operations performed:</p> <ul style="list-style-type: none"> • tolerance to BS 4500 or BS 1916 Grade 5 • surface texture 8 μin or 0.2μm • angles within +/- 0.5 degree • components to be free from false grinding cuts, burrs and sharp edges 	
		<p>1.9 Grind components made from one of the following types of material:</p>	

			<ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
		1.10	Carry out quality sampling checks at suitable intervals	
		1.11	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • dimensions • parallelism • squareness • profile • concentricity • thread form • surface texture • angle/taper • ovality/lobing 	
		1.12	Deal promptly and effectively with problems within their control and report those that cannot be solved	
		1.13	Shut down the equipment to a safe condition on conclusion of the machining activities	
2.	Know how to Operate Grinding Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating grinding machines	
		2.2	Describe the safety mechanisms on the machine, and the procedure for checking that they function correctly	
		2.3	Describe the operation of the machine controls in both hand and power modes	
		2.4	Explain how to stop the machine in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the hazards associated with operating grinding machines and carrying out the grinding operations (such as moving machine parts, sparks/airborne particles, bursting grinding wheels, insecure workpiece), and how to minimise them and reduce any risks	
		2.7	Describe the importance of keeping the work area clean and tidy	
		2.8	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.9	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.10	Explain how to use imperial and metric systems of measurement	
		2.11	Describe the main features of the grinding machine, and the accessories that can be used	

	2.12	Describe the various grinding operations that can be performed, and the methods and equipment used	
	2.13	Describe the effects of backlash in machine slides and screws, and how this can be overcome	
	2.14	Describe the application of roughing and finishing cuts, and the effect on wheel life, surface finish and dimensional accuracy	
	2.15	Explain how to dress and reshape grinding wheels, and the equipment to be used	
	2.16	Describe the application of cutting fluids with regard to a range of different materials	
	2.17	Describe the effects of clamping the workpiece in/on a chuck/workholding device, and how this can cause distortion in the finished components	
	2.18	Explain how to recognise machining faults and identify when wheels need dressing	
	2.19	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.20	Describe the problems that can occur with the grinding activities, and how these can be overcome	
	2.21	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Turning Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out turning operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machines, or CNC machining centres. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly.

The learner will be expected to produce a range of components that combine a number of different features, such as parallel, stepped and tapered diameters, drilled and reamed holes, internal and external threads, special forms and profiles. The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to monitor continuously the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying CNC machining procedures. The learner will have an understanding of the CNC turning process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		M/600/6020
Qualification Framework		RQF
Title		Operating CNC Turning Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Turning Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Check all of the following to confirm that the machine is ready for operation: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

		1.5 Operate one of the following CNC turning machines: <ul style="list-style-type: none"> • CNC lathe • CNC machining centre 	
		1.6 Produce machined components which combine different operations and cover six of the following features: <ul style="list-style-type: none"> • parallel diameters • stepped diameters • tapered diameters • flat faces • internal undercuts • external undercuts • internal profiles • external profiles • reamed holes • tapped holes • drilled holes • parting-off • eccentric diameters • external screw threads • internal screw threads • chamfers and radii • bored holes • grooves 	
		1.7 Machine one of the following types of material: <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
		1.8 Produce components with dimensional accuracy, form and surface texture within all the relevant quality and accuracy standards, as applicable to the operations performed: <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS4500 or BS 1916 Grade 9 • surface finish 63µin or 1.6µm • reamed and bored holes within H 8 • angles within +/- 0.5 degree • screw threads BS medium fit 	
		1.9 Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
		1.10 Monitor the computer process and ensure that the production output is to the required specification	

		1.11	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • diameters • hole size/fit • angle/taper • lengths/depths • surface finish • thread fit 	
		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Turning Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC lathes	
		2.2	Describe the safety mechanisms on the CNC turning machine, and the procedure for checking that they function correctly	
		2.3	Describe the hazards associated with working on CNC lathes (such as use of power operated chucks, moving machinery, automatic machine operation, handling cutting tools, lifting and handling work holding devices, hot and airborne metal particles), and how to minimise them and reduce any risks	
		2.4	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.5	Describe the importance of keeping the work area clean and tidy	
		2.6	Describe the main features of the CNC turning machine, and the accessories that can be used	
		2.7	Describe the various CNC turning operations that can be performed, and the methods and equipment used	
		2.8	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.9	Explain how to stop the CNC lathe in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.10	Explain how to use the visual display and understand the various messages displayed	
		2.11	Describe the function of error messages, and what to do when an error message is displayed	
		2.12	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.13	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.14	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.15	Explain how to use imperial and metric systems of measurement	

		2.16	Describe the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy	
		2.17	Describe the application of cutting fluids with regard to a range of different materials	
		2.18	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
		2.19	Explain how to recognise CNC turning faults, and how to identify when tools need re-sharpening/replacing	
		2.20	Describe the quality control procedures that are used, inspection checks to be carried out, and the equipment that will need to be used	
		2.21	Describe the problems that can occur with the CNC turning activities, and how these can be overcome	
		2.22	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Milling Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to operate Computer Numerical Control (CNC) three-axis or multi-axis machines, or CNC machining centres, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly.

The learner will be expected to produce a range of components that combine a number of different features, such as flat faces, angled faces, internal and external profiles, slots, steps, holes which are linearly or radially pitched, and special profiles such as convex or concave. The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying CNC milling procedures. The learner will have an understanding of the CNC milling process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		D/600/6031
Qualification Framework		RQF
Title		Operating CNC Milling Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Milling Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	

	1.4	Follow the defined procedures for starting and running the operating system	
	1.5	Operate one of the following CNC milling machines: <ul style="list-style-type: none"> • CNC three-axis milling machine • CNC multi-axis milling machine • CNC machining centre 	
	1.6	Produce machined components which combine different operations and cover six of the following: <ul style="list-style-type: none"> • flat faces • steps/shoulders • enclosed slots/recesses • internal profiles • holes on pitched circles • parallel faces • angular faces • open ended slots • external profiles • holes linearly pitched • circular/curved profiles • tapped holes • special forms (such as concave, convex) • faces that are square to each other 	
	1.7	Machine components made from one of the following types of material: <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
	1.8	Produce components with dimensional accuracy, form and surface texture within all the relevant quality and accuracy standards as is applicable to the operations performed: <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS4500 or BS 1916 Grade 9 • surface finish 63µin or 1.6µm • reamed and bored holes within H 8 • flatness and squareness within 0.001" per inch or 0.025mm per 25mm • angles within +/- 0.5 degree 	
	1.9	Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
	1.10	Monitor the computer process and ensure that the production output is to the required specification	
	1.11	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • dimensions 	

		<ul style="list-style-type: none"> • squareness • hole size/fit • surface finish • angles • flatness • slots • recesses 		
		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Milling Machines	2.1	Describe the specific safety precautions to be taken when working with CNC milling machines and equipment	
		2.2	Describe the safety mechanisms on the machine, and the procedures for checking that they are operating correctly	
		2.3	Explain how to start and stop the machine in both normal and emergency situations and the procedure for restarting after an emergency	
		2.4	Describe the hazards associated with working on CNC milling machines (such as use of power operated work holding devices, moving machinery, automatic machine operation, handling cutting tools, hot and airborne metal particles), and how to minimise them and reduce any risks	
		2.5	Describe the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy	
		2.6	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.7	Describe the main features of the CNC milling machine, and the accessories that can be used	
		2.8	Describe the various CNC milling operations that can be performed, and the methods and equipment used	
		2.9	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.10	Explain how to use the visual display and understand the various messages displayed	
		2.11	Describe the function of error messages, and what to do when an error message is displayed	
		2.12	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.13	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.14	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.15	Explain how to use imperial and metric systems of measurement	

	2.16	Describe the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy	
	2.17	Describe the application of cutting fluids with regard to a range of different materials	
	2.18	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
	2.19	Explain how to recognise CNC milling faults, and how to identify when tools need re-sharpening/replacing	
	2.20	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.21	Describe the problems that can occur with the CNC milling activities, and how these can be overcome	
	2.22	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Grinding Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out grinding operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machines, such as universal grinding machines, gear grinding machines, thread grinding machines, ring grinding machines and grinding machining centres. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly.

The learner will be expected to produce a range of components that combine a number of different features, such as ground plain diameters, external screw threads, stepped diameters, flat faces and shoulders, chamfers, special forms, internal and external profiles, tapered diameters and faces, grooves/undercuts, parallel and tapered bores.

The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying machining procedures. The learner will have an understanding of the CNC grinding process used, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		H/600/6032
Qualification Framework		RQF
Title		Operating CNC Grinding Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Grinding Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

		1.5	<p>Operate one of the following CNC grinding machines:</p> <ul style="list-style-type: none"> • CNC universal grinder • CNC gear grinder • CNC grinding machining centre • CNC thread grinder • other specific CNC grinding machine 	
		1.6	<p>Produce ground components which cover four of the following, as applicable to the machine type used:</p> <ul style="list-style-type: none"> • plain diameters • stepped diameters • tapered diameters • flat faces and shoulders • internal and external profiles • eccentric diameters • external screw threads • chamfers and radii • parallel bores • tapered bores • involute and helical forms • curvic couplings • special forms (such as concave, convex) • internal/external undercuts/bearing tracks 	
		1.7	<p>Machine one type of material from the following:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
		1.8	<p>Produce component with dimensional accuracy, form and surface texture within all of the following quality and accuracy standards as is applicable to the operations performed:</p> <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS4500 or BS 1916 Grade 7 • flatness and squareness within 0.0005" per inch or 0.0125mm per 25mm • angles within +/- 0.5 degree • surface finish 16µin or 0.8µm • ground bores/holes within H 8 • screw threads BS medium fit 	
		1.9	<p>Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved</p>	
		1.10	<p>Monitor the computer process and ensure that the production output is to the required specification</p>	

		1.11	Use appropriate gauges or instruments to carry out the necessary checks for accuracy, during production, of three of the following: <ul style="list-style-type: none"> • dimensions • parallelism • squareness • profile • concentricity • thread form • surface texture • angle/taper • ovality/lobing • hole size 	
		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Grinding Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC grinding machines	
		2.2	Describe the safety mechanisms on the CNC grinding machine, and the procedure for checking that they function correctly	
		2.3	Explain how to stop the CNC grinding machine in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.4	Describe the hazards associated with working on CNC grinding machines (such as moving machinery, automatic machine operation, sparks/airborne particles, bursting grinding wheels), and how to minimise them and reduce any risk	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the importance of keeping the work area clean and tidy	
		2.7	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.8	Explain how to use the visual display and understand the various messages displayed	
		2.9	Describe the function of error messages, and what to do when an error message is displayed	
		2.10	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.11	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.12	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.13	Explain how to use imperial and metric systems of measurement	

	2.14	Describe the main features of the CNC grinding machine, and the accessories that can be used	
	2.15	Describe the various CNC grinding operations that can be performed, and the methods and equipment used	
	2.16	Explain how to handle and store grinding wheels safely and correctly	
	2.17	Describe the application of roughing and finishing cuts, and the effect on wheel life, surface finish and dimensional accuracy	
	2.18	Describe the application of cutting fluids with regard to a range of different materials	
	2.19	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
	2.20	Explain how to recognise CNC grinding machining faults, and identify when adjustments need to be made	
	2.21	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.22	Describe the problems that can occur with the CNC grinding activities, and how these can be overcome	
	2.23	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Punching Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out pressing and punching operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machines. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly. The learner will be expected to produce a range of components that cover a number of different features, such as linearly pitched holes, radially pitched holes, internal square/rectangular profiles, curved/circular profiles, swages, louvres, forms and profiles.

The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying machining procedures. The learner will have an understanding of the CNC pressing/punching process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		K/600/6033
Qualification Framework		RQF
Title		Operating CNC Punching Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Punching Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

		1.5	Operate one of the following CNC punching machines: <ul style="list-style-type: none"> • CNC punching machine • CNC fabrication machining centre for punching operations 	
		1.6	Produce components which cover four of the following features: <ul style="list-style-type: none"> • holes linearly pitched • holes radially pitched • square/rectangular profiles • curved profiles • swages • louvres • other applications 	
		1.7	Machine one of the following types of material: <ul style="list-style-type: none"> • ferrous • non-ferrous • special alloys 	
		1.8	Produce components within all of the following quality and accuracy standards: <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS 4500 or BS 1916 Grade 9 • components to be free from deformity, burrs and sharp edges 	
		1.9	Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
		1.10	Monitor the computer process and ensure that the production output is to the required specification	
		1.11	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • dimensions of punched features • position of features • hole positions linearly pitched • hole positions radially pitched • accuracy of profiles • flatness/freedom from excessive distortion • accuracy of louvres and swages 	
		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Punching Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC pressing/punching machines	
		2.2	Describe the safety mechanisms on the CNC pressing/punching machine, and the procedure for checking that they function correctly	

	2.3	Describe the hazards associated with working on CNC punching machines (such as moving machinery, automatic machine operation, lifting and handling sheet materials), and how to minimise them and reduce any risks	
	2.4	Explain how to stop the CNC pressing/punching machine in both normal and emergency situations, and the procedure for restarting after an emergency	
	2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
	2.6	Describe the importance of keeping the work area clean and tidy	
	2.7	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
	2.8	Explain how to use the visual display and understand the various messages displayed	
	2.9	Describe the function of error messages, and what to do when an error message is displayed	
	2.10	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
	2.11	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
	2.12	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
	2.13	Explain how to use imperial and metric systems of measurement	
	2.14	Describe the main features of the CNC pressing/punching machine, and the accessories that can be used	
	2.15	Describe the various CNC pressing/punching operations that can be performed, and the methods and equipment used	
	2.16	Describe the effects of clamping the workpiece in a workholding device, and how this can cause distortion in the finished components	
	2.17	Explain how to recognise CNC pressing/punching faults, and how to identify when tools need re-sharpening, replacing or adjustments are required	
	2.18	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.19	Describe the problems that can occur with the CNC pressing/punching activities, and how these can be overcome	
	2.20	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Laser Profiling Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out cutting and profiling operations using Computer Numerical Control (CNC) laser profiling machines, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the machine-operating program, dealing with any error messages and executing the program activities safely and correctly. The learner will be expected to produce a range of components that cover a number of different features, such as square and rectangular profiles, angular profiles, curved profiles, circles, holes linearly positioned, holes radially positioned, slots and grooves.

The learner will be required to operate the CNC laser cutting machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying CNC laser machining procedures. The learner will have an understanding of the CNC laser cutting process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		M/600/6034
Qualification Framework		RQF
Title		Operating CNC Laser Profiling Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Laser Profiling Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the laser lens is clean and in a suitable condition • check that the operating program is at the correct start point • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	

		1.4	Follow the defined procedures for starting and running the operating system	
		1.5	Produce machined components which cover four of the following features: <ul style="list-style-type: none"> • square/rectangular profiles • angular profiles • curved profiles • circles • ellipses • holes linearly positioned • holes radially positioned • slots and apertures • other features 	
		1.6	Machine one of the following types of material: <ul style="list-style-type: none"> • ferrous • non-ferrous • stainless/alloy steel • non-metallic 	
		1.7	Produce component within all of the following quality and accuracy standards: <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS4500 or BS 1916 Grade 7 • angles within +/- 0.5 degree • surface texture within 63µin or 1.6µm 	
		1.8	Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
		1.9	Monitor the computer process and ensure that the production output is to the required specification	
		1.10	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • dimensions • position of features • holes positioned linearly • holes positioned radially • angles • profiles • flatness/freedom from distortion 	
		1.11	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Laser Profiling Machines	2.1	Describe the safe working practices and procedures to be observed when operating CNC laser profiling machines (care when working with high power laser beams, machine guards; ventilation and fume extraction; machine safety devices)	

	2.2	Explain how to stop the CNC laser cutting machines in both normal and emergency situations, and the procedure for restarting after an emergency	
	2.3	Describe the hazards associated with laser profiling machines (dangers from the high power laser beam; live electrical components; moving parts of machinery), and how to minimise them and reduce any risks	
	2.4	Describe the personal protective equipment to be worn, and where this can be obtained	
	2.5	Describe the importance of keeping the work area clean and tidy	
	2.6	Describe the main features of the CNC laser cutting, and the accessories that can be used	
	2.7	Describe the various CNC machining operations that can be performed, and the methods and equipment used	
	2.8	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
	2.9	Explain how to use the visual display and understand the various messages displayed	
	2.10	Describe the function of error messages, and what to do when an error message is displayed	
	2.11	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
	2.12	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
	2.13	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
	2.14	Explain how to use imperial and metric systems of measurement	
	2.15	Describe the effects of clamping the workpiece in a workholding device, and how this can cause distortion in the finished components	
	2.16	Explain how to recognise CNC laser cutting faults, and how to identify when actions need to be taken	
	2.17	Describe the quality control procedures that are used, inspection checks to be carried out, and the equipment that will need to be used	
	2.18	Describe the problems that can occur with the CNC laser cutting activities, and how these can be overcome	
	2.19	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Electro-Discharge Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to operate Computer Numerical Control (CNC) electro-discharge machines, such as spark erosion and wire erosion machines, in accordance with approved procedures. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. The learner will be expected to produce a range of components that cover a number of different features, such as flat, tapered and angled faces, internal and external profiles, parallel and tapered slots and steps, parallel and tapered holes which are linearly or radially pitched.

The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying procedures for electro-discharge machining. The learner will have an understanding of the CNC electro-discharge process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		F/600/6037
Qualification Framework		RQF
Title		Operating CNC Electro-Discharge Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Electro-Discharge Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • ensure that the dielectric fluid is at an appropriate level • check that the operating program is at the correct start point • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

		1.5 Operate one of the following CNC electro-discharge machines: <ul style="list-style-type: none"> ● CNC spark erosion machine ● CNC wire erosion machine ● CNC electro-discharge machining centre 	
		1.6 Produce machined components which cover six of the following: <ul style="list-style-type: none"> ● flat faces ● parallel faces ● tapered faces ● angular faces ● open-ended slots/recesses ● internal profiles ● external profiles ● faces square to each other ● enclosed slots/recesses ● tapered holes ● holes on pitched circles ● linear holes (rows, angles) ● special profiles (e.g. concave, convex) ● parallel and tapered steps/slots/shoulders ● circular/curved profiles (internal and external) ● other special forms or features 	
		1.7 Machine components made from one of the following types of material: <ul style="list-style-type: none"> ● ferrous based ● non-ferrous based 	
		1.8 Produce components with dimensional accuracy, form and surface texture within all of the following quality and accuracy standards as is applicable to the operations performed: <ul style="list-style-type: none"> ● dimensional tolerance equivalent to BS4500 or BS 1916 Grade 7 ● flatness and squareness within 0.001" per inch or 0.025mm per 25mm ● components to be free from false starts, and sharp edges ● angles within +/- 0.5 degree ● machined holes within H 8 ● surface finish 32 µin; 0.8µm; 18VDI 	
		1.9 Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
		1.10 Monitor the computer process and ensure that the production output is to the required specification	
		1.11 Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> ● dimensions 	

		<ul style="list-style-type: none"> • position • parallelism • angle/taper • squareness • surface texture • profile 		
		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Electro-Discharge Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC electro-discharge machines	
		2.2	Describe the safety mechanisms on the CNC electro-discharge machine, and the procedure for checking that they function correctly	
		2.3	Explain how to stop the CNC electro-discharge machine in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.4	Describe the hazards associated with the electro-discharge machining operations (such as moving machine parts, electrical components, handling dielectrics, fumes), and how to minimise them and reduce any risks	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the importance of keeping the work area clean and tidy	
		2.7	Describe the main features of the CNC electro-discharge machines, and the accessories that can be used	
		2.8	Describe the various CNC electro-discharge operations that can be performed, and the methods and equipment used	
		2.9	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.10	Explain how to use the visual display and understand the various messages displayed	
		2.11	Describe the function of error messages, and what to do when an error message is displayed	
		2.12	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.13	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.14	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.15	Explain how to use imperial and metric systems of measurement	
	2.16	Describe the application of dielectric and ionised fluids with regards to a range of different materials		

	2.17	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
	2.18	Explain how to recognise CNC electro-discharge machining faults, and when actions need to be taken	
	2.19	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.20	Describe the problems that can occur with the CNC electro-discharge machining activities, and how these can be overcome	
	2.21	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Gear Cutting Machines

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out gear cutting operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machines. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly.

The learner will be expected to produce a range of components that combine a number of different features, such as internal and external spur gears, helical gears, involute splines, straight splines, serrations, racks and bevel gears.

The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying machining procedures. The learner will have an understanding of the CNC gear cutting process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		J/600/6038
Qualification Framework		RQF
Title		Operating CNC Gear Cutting Machines
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Gear Cutting Machines	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

	1.5	Operate one of the following CNC gear cutting machines: <ul style="list-style-type: none"> • CNC gear cutting machine • CNC gear hobbing machine • CNC gear shaving machine 	
	1.6	Produce machined components which cover four of the following, as applicable to the machine type used: <ul style="list-style-type: none"> • external spur gears • internal spur gears • external helical gears • internal helical gears • straight splines • involute splines • serrations • bevel gears • racks 	
	1.7	Machine one of the following types of material: <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
	1.8	Produce components with dimensional accuracy, form and surface texture within all the relevant quality and accuracy standards as is applicable to the operations performed: <ul style="list-style-type: none"> • components to be free from false tool cuts, burrs and sharp edges • straight splines and serrations to BS 2059 or BS1953 Class 1 • spur and helical gears to BS 436 Pt 1 or BS1967 • involute splines to BS 3550 1963 Class 1 • tolerance to BS 4500 or BS1916 Grade 9 • surface texture 63 μin or 1.6μm 	
	1.9	Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved	
	1.10	Monitor the computer process and ensure that the production output is to the required specification	
	1.11	Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of three of the following: <ul style="list-style-type: none"> • gear blanks • lead and helix angle • gear tooth thickness • involute form • composite error rolling test • surface texture 	

		1.12	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Gear Cutting Machines	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC gear cutting machines	
		2.2	Describe the safety mechanisms on the machine, and the procedures for checking that they are operating correctly	
		2.3	Explain how to stop the CNC gear cutting machine in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.4	Describe the hazards associated with working on CNC gear cutting machines (such as using moving machinery, automatic machine operation, handling cutting tools, hot and airborne metal particles), and how to minimise them and reduce any risks	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the importance of keeping the work area clean and tidy	
		2.7	Describe the main features of the CNC gear cutting machine, and the accessories that can be used	
		2.8	Describe the various CNC gear cutting operations that can be performed, and the methods and equipment used	
		2.9	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.10	Explain how to use the visual display and understand the various messages displayed	
		2.11	Describe the function of error messages, and what to do when an error message is displayed	
		2.12	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.13	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.14	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.15	Explain how to use imperial and metric systems of measurement	
		2.16	Describe the application of roughing and finishing cuts, and the effect on cutter life, surface finish and dimensional accuracy	
		2.17	Describe the application of cutting fluids with regards to a range of different materials	
		2.18	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
		2.19	Explain how to recognise CNC gear cutting faults, and how to identify when tools need re-sharpening/replacing	
		2.20	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	

		2.21	Describe the problems that can occur with the CNC gear cutting activities, and how these can be overcome	
		2.22	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Operating CNC Machining Centres

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out machining operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machining centres. The learner will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages and executing the program activities safely and correctly.

The learner will be expected to produce a range of components that cover a number of different features, such as bored holes, tapered holes, external diameters, flat faces, square and parallel faces, angular faces, slots, indexed and rotated forms, internal and external forms, grooves, drilled, reamed and tapped holes.

The learner will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will be sufficient to provide a sound basis for their work and will enable them to adopt an informed approach to applying CNC machining procedures. The learner will have an understanding of the CNC machining centre process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, its associated tools and equipment. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		L/600/6039
Qualification Framework		RQF
Title		Operating CNC Machining Centres
Unit Level		Level 2
Guided Learning Hours		130
Unit Credit Value		39
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Operating CNC Machining Centres	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Confirm that the equipment is set up and ready for operation	
		1.3	Confirm that the machine is ready for operation by checking all of the following: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • confirm with the machine setter that the machine is ready for production • where appropriate, seek any necessary instruction/training on the operation of the machine • ensure that machine guards are in place and are correctly adjusted • hold components securely, without distortion • check that the operating program is at the correct start point and the workpiece is clear of the machine spindle • follow the defined operating procedures and apply safe working practices and procedures at all times • ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy • ensure that the components produced meet the required specification for quality and accuracy • leave the work area and machine in a safe and appropriate condition on completion of the activities 	
		1.4	Follow the defined procedures for starting and running the operating system	

		<p>1.5 Produce components which cover six of the following:</p> <ul style="list-style-type: none"> • external diameters • tapered diameters • shoulders and steps • bored holes • tapered holes • flat faces • tapped holes • square and parallel faces • angular faces • slots • indexed or rotated forms • internal profiles • external profiles • internal threads • external threads • grooves • undercuts • drilled holes • reamed holes 	
		<p>1.6 Machine one of the following types of material:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • non-metallic 	
		<p>1.7 Produce component with dimensional accuracy, form and surface texture within all of the following quality and accuracy standards as is applicable to the operations performed:</p> <ul style="list-style-type: none"> • dimensional tolerance equivalent to BS4500 or BS 1916 Grade 9 • components to be free from false tool cuts, burrs and sharp edges • flatness and squareness within 0.001" per inch or 0.025mm per 25mm • reamed/bored holes within H 8 • angles within +/- 0.5 degree • screw threads BS medium fit • surface finish 63µin or 1.6µm 	
		<p>1.8 Deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved</p>	
		<p>1.9 Monitor the computer process and ensure that the production output is to the required specification</p>	
		<p>1.10 Use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of four of the following:</p>	

		<ul style="list-style-type: none"> • external diameters • internal diameters • lengths/depths • reamed hole size/fit • taper/angles • thread fit • slot or recess width and position • surface finish • flatness of faces • squareness of faces 		
		1.11	Shut down the equipment to a safe condition on conclusion of the activities	
2.	Know how to Operate CNC Machining Centres	2.1	Describe the safe working practices and procedures to be followed whilst operating CNC machining centres	
		2.2	Describe the safety mechanisms on the machine, and the procedures for checking that they are operating correctly	
		2.3	Explain how to stop the CNC machining centre in both normal and emergency situations, and the procedure for restarting after an emergency	
		2.4	Describe the hazards associated with working on CNC machining centres (such as use of moving machinery, automatic machine operation, handling cutting tools, hot and airborne metal particles), and how to minimise them and reduce any risk	
		2.5	Describe the personal protective equipment to be worn, and where this can be obtained	
		2.6	Describe the importance of keeping the work area clean and tidy	
		2.7	Describe the main features of the CNC machining centre, and the accessories that can be used	
		2.8	Describe the various CNC machining operations that can be performed, and the methods and equipment used	
		2.9	Describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)	
		2.10	Explain how to use the visual display and understand the various messages displayed	
		2.11	Describe the function of error messages, and what to do when an error message is displayed	
		2.12	Explain how to find the correct restart point in the program when the machine has been stopped before completion of the program	
		2.13	Explain where to obtain the component drawings, specifications and/or job instructions required for the components to be machined	
		2.14	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken	

	2.15	Explain how to use imperial and metric systems of measurement	
	2.16	Explain how to handle and store tools and cutters safely and correctly	
	2.17	Describe the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy	
	2.18	Describe the application of cutting fluids with regards to a range of different materials	
	2.19	Describe the effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components	
	2.20	Explain how to recognise CNC machining faults, and how to identify when tools need re-sharpening/replacing	
	2.21	Describe the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used	
	2.22	Describe the problems that can occur with the CNC machining activities, and how these can be overcome	
	2.23	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Producing Mechanical Sub-Assemblies/
Assemblies

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to carry out assembly operations to produce mechanical assemblies, in accordance with approved procedures. The learner will be required to check that specified components are available and fit for purpose, to obtain all relevant and current documentation, to obtain the tools and equipment required for the assembly operations, and to check that they are in a safe and usable condition. In carrying out the assembly operations, the learner will be required to follow company procedures and specified assembly techniques, in order to produce the assembly.

The assembly activities will also include making all necessary checks and adjustments to ensure the components are correctly orientated, positioned and aligned, that moving parts have the correct working clearances, all fasteners are tightened to the correct torque and that the assembled parts are checked for completeness and function as per the specification.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the assembly activities, materials or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision taking, personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will be sufficient to provide a good understanding of their work and will provide an informed approach to applying the assembly techniques and procedures. The learner will understand the mechanical product being assembled, and its application, and will know about the equipment, relevant components and joining techniques in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the assembly activities. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		F/600/6040
Qualification Framework		RQF
Title		Producing Mechanical Sub-Assemblies/Assemblies
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Producing Mechanical Sub-Assemblies/Assemblies	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Carry out all of the following during the assembly activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • check that tools and measuring instruments to be used are fit for service • use lifting and slinging equipment (where appropriate) in accordance with health and safety guidelines and procedures • use appropriate and approved assembly techniques at all times • ensure that the components used are free from damage, foreign objects, dirt or other contamination • leave the work area in a safe and appropriate condition on completion of the activities 	
		1.3	Follow the relevant instructions, assembly drawings and any other specifications	
		1.4	Ensure that the specified components are available and that they are in a usable condition	
		1.5	Use the appropriate methods and techniques to assemble the components in their correct positions	
		1.6	Produce assemblies using four of the following methods and techniques: <ul style="list-style-type: none"> • assembly of components by expansion/contraction • fitting (such as filing, scraping, lapping or polishing) • securing using mechanical fasteners/threaded devices • applying sealants/adhesives 	

		<ul style="list-style-type: none"> • electrical bonding of components • assembly of products by pressure • setting working clearances • drilling • reaming • balancing components • applying bolt locking methods • shimming and packing • blue-bedding of components • aligning components • riveting • torque setting • soldering/brazing 	
	1.7	Produce assemblies constructed from two of the following <ul style="list-style-type: none"> • sub-assemblies • support framework • component kits • fastener kits • casings, panels • single components 	
	1.8	Assemble products using one of the following assembly aids and equipment: <ul style="list-style-type: none"> • workholding devices • lifting and moving equipment • specialised assembly tools/equipment • jigs and fixtures • shims and packing • rollers or wedges • supporting equipment 	
	1.9	Secure the components using the specified connectors and securing devices	
	1.10	Check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification	
	1.11	Carry out quality checks using appropriate equipment, to include four of the following: <ul style="list-style-type: none"> • positional accuracy • freedom of movement • component security • completeness • dimensions • orientation • alignment 	

		<ul style="list-style-type: none"> • function • bearing end float • operating/working clearances • free from damage or foreign objects 	
		1.12 Produce mechanical assemblies which comply with one of the following quality and accuracy standards: <ul style="list-style-type: none"> • BS, ISO or BSEN standards and procedures • customer standards and requirements • company standards and procedures • specific system requirements 	
		1.13 Deal promptly and effectively with problems within their control and report those that cannot be solved	
2.	Know how to Produce Mechanical Sub-Assemblies/Assemblies	2.1 Describe the specific safety precautions to be taken whilst carrying out the mechanical assembly (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)	
		2.2 Describe the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility they place on them	
		2.3 Describe the COSHH regulations with regards to the substances used in the assembly process	
		2.4 Describe the hazards associated with producing mechanical assemblies, and how to minimise them and reduce any risks	
		2.5 Describe the personal protective equipment and clothing to be worn during the assembly activities	
		2.6 Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
		2.7 Describe the general principles of mechanical assembly, and the purpose and function of the components and materials used, including component identification systems (such as codes and component orientation indicators)	
		2.8 Describe the preparations that need to be undertaken on the components prior to fitting them into the assembly	
		2.9 Describe the assembly/joining methods, techniques and procedures to be used, and the importance of adhering to these	
		2.10 Explain how the components are to be aligned, adjusted and positioned prior to securing, and the tools and equipment that is used	
		2.11 Describe the importance of using the specified components and joining devices for the assembly, and why they must not use substitutes	

	2.12	Explain where appropriate, the application of sealants and adhesives within the assembly activities, and the precautions that must be taken when working with them	
	2.13	Describe the quality control procedures to be followed during the assembly operations	
	2.14	Explain how to conduct any necessary checks to ensure the accuracy, position, security, function and completeness of the assembly	
	2.15	Describe the methods and equipment used to transport, lift and handle components and assemblies	
	2.16	Explain how to check that the tools and equipment to be used are in a safe and serviceable condition	
	2.17	Describe the importance of ensuring that all tools are used correctly and within their permitted operating range	
	2.18	Describe the things that can go wrong with the assembly operations, and what to do if they occur	
	2.19	Describe the extent of their own responsibility and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Assembling Fluid Power Components to
Mechanical Equipment

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to assemble and fit fluid power components (such as pneumatic, hydraulic, or vacuum) to mechanical equipment, in accordance with approved procedures. The learner will be required to check the specified components are available and fit for purpose, to obtain all relevant and current documentation, to obtain the tools and equipment required for the assembly operations and to check that they are in a safe and usable condition. In carrying out the fitting and assembly operations, they will be required to follow company procedures and specified assembly techniques, in order to assemble the required components.

The assembly activities will also include making all necessary checks and adjustments, to ensure the fluid power components are correctly positioned and aligned, that moving parts have the correct working clearances, all fasteners are tightened to the correct torque and that the assembled parts are checked for completeness.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the assembly activities, materials or equipment that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will be sufficient to provide a good understanding of their work and will provide an informed approach to applying fluid power assembly techniques and procedures. The learner will understand the mechanical product being assembled, and its application, and will know about the equipment, relevant components and joining techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the assembly activities. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		L/600/6042
Qualification Framework		RQF
Title		Assembling Fluid Power Components to Mechanical Equipment
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Assembling Fluid Power Components to Mechanical Equipment	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Carry out all of the following during the assembly activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • check that tools and measuring instruments to be used are fit for service • ensure that components and pipes used are free from damage, foreign objects, dirt or other contamination • use appropriate and approved fitting and assembly techniques at all times • leave the work area in a safe and appropriate condition on completion of the activities 	
		1.3	Follow the relevant instructions, assembly drawings and any other specifications	
		1.4	Ensure that the specified components are available and that they are in a usable condition	
		1.5	Use the appropriate methods and techniques to assemble the components in their correct positions	
		1.6	Assemble and fit components for one of the following types of fluid power systems: <ul style="list-style-type: none"> • pneumatic • hydraulic • vacuum • electro-fluid power systems 	
		1.7	Prepare and fit four of the following fluid power components and materials to mechanical equipment: <ul style="list-style-type: none"> • power generation components (such as motors, pumps, compressors, intensifiers) 	

			<ul style="list-style-type: none"> • fluid conditioning components (such as filters, lubricators, separation units, heaters/driers, cooler units) • storage devices (such as reservoirs, accumulators) • monitoring components (such as sensors, meters, gauges and indicators) • pipework (such as rigid pipe, flexible pipe, hoses) • connection devices (such as manifolds, couplings, cables and wires) • control components (such as valves, actuators/cylinders, regulators) 	
		1.8	Secure the components using the specified connectors and securing devices	
		1.9	Check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification	
		1.10	Carry out the quality checks using appropriate equipment, to include four of the following: <ul style="list-style-type: none"> • dimensions • positional accuracy • alignment • correct direction and flow • leak or pressure tests • component security • electrical continuity • completeness • function • pipework (free from ripple and creases) 	
		1.11	Produce fluid power assemblies which comply with one of the following quality and accuracy standards: <ul style="list-style-type: none"> • BS, ISO or BSEN standards and procedures • customer standards and requirements • company standards and procedures • specific system requirements 	
		1.12	Deal promptly and effectively with problems within their control and report those that cannot be solved	
2.	Know how to Assemble Fluid Power Components to Mechanical Equipment	2.1	Describe the specific safety precautions to be taken while carrying out the fluid power assembly (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)	
		2.2	Describe the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility these requirements place on them	
		2.3	Describe the COSHH regulations with regard to the substances used in the fluid power assembly process	
		2.4	Describe the hazards associated with assembling fluid power system components, and how to minimise them and reduce any risks	

	2.5	Describe the personal protective equipment and clothing to be worn during the assembly activities	
	2.6	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
	2.7	Describe the general principles of fluid power, and the purpose and function of the components and materials used	
	2.8	Describe the preparations to be undertaken on the components prior to fitting them onto the assembly	
	2.9	Describe the fitting and assembly methods and procedures to be used, and the importance of adhering to these procedures	
	2.10	Explain how the components are to be aligned, adjusted and positioned prior to securing, and the tools and equipment that are used	
	2.11	Describe the importance of using the specified components for the assembly, and why they must not use substitutes	
	2.12	Describe the quality control procedures to be followed during the assembly operations	
	2.13	Explain how to detect assembly defects/faults (such as ineffective joining techniques, foreign objects, component damage), and what to do to rectify them	
	2.14	Describe the methods and equipment used to transport, lift and handle components and assemblies	
	2.15	Explain how to check that the tools and equipment to be used are in a safe and serviceable condition	
	2.16	Describe the importance of ensuring that all tools are used correctly and within their permitted operating range	
	2.17	Describe the things that can go wrong with the assembly operations, and what to do if they occur	
	2.18	Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve	



Level 2 Unit – Assembling Electrical or Electronic Components
to Mechanical Equipment

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to assemble electrical or electronic components to mechanical equipment, in accordance with approved procedures. The learner will be required to check that specified components are available and fit for purpose, to obtain all relevant and current documentation, to obtain the tools and equipment required for the assembly operations and to check that they are in a safe and usable condition. In carrying out the assembly operations, the learner will be required to follow company procedures and specified assembly techniques, in order to fit the electrical or electronic components to the mechanical assembly.

The assembly activities will also include making all necessary checks and adjustments, to ensure that the electrical or electronic components are correctly orientated, positioned and secured correctly. The learner must also check that any cables and wires are routed correctly and are tidy in appearance, and that connections are mechanically sound and checked for electrical continuity.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the assembly activities, materials or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will be sufficient to provide a good understanding of their work and will provide an informed approach to applying electrical or electronic fitting and assembly techniques and procedures. The learner will have an understanding of the product being assembled and its application, and will know about the equipment, relevant components and joining techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the assembly activities. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		R/600/6043
Qualification Framework		RQF
Title		Assembling Electrical or Electronic Components to Mechanical Equipment
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Assembling Electrical or Electronic Components to Mechanical Equipment	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Carry out all of the following during the assembly activities: <ul style="list-style-type: none"> • obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work • use lifting and slinging equipment (where appropriate) in accordance with health and safety guidelines and procedures • check that tools and measuring instruments to be used are fit for service • use appropriate and approved fitting and assembly techniques at all times • ensure that the components used are free from damage, foreign objects, dirt or other contamination • leave the work area in a safe and appropriate condition on completion of the activities 	
		1.3	Follow the relevant instructions, assembly drawings and any other specifications	
		1.4	Ensure that the specified components are available and that they are in a usable condition	
		1.5	Use the appropriate methods and techniques to assemble the components in their correct positions	
		1.6	Fit electrical or electronic components using all of the following techniques: <ul style="list-style-type: none"> • routing cables and wires • mounting/securing components • cable fixings and fasteners 	
		1.7	Terminate and join cables/wires to components using two of the following: <ul style="list-style-type: none"> • screwed connections 	

			<ul style="list-style-type: none"> • clamped connections • soldering • crimping • cable protection devices (such as sleeving or grommets) 	
		1.8	Fit four of the following electrical components on the mechanical equipment: <ul style="list-style-type: none"> • cable enclosures (such as conduit, trunking, tray work) • circuit connection devices (such as plugs, sockets) • monitoring components (such as sensors) • power generation components (such as motors, transformers) • control components (such as relays, solenoids, switches) • cables and wires • lamps/lighting • electronic modules • instrumentation units • circuit protection devices • other specific components 	
		1.9	Secure the components using the specified connectors and securing devices	
		1.10	Check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification	
		1.11	Carry out the required checks using the correct tools and equipment, to include four of the following: <ul style="list-style-type: none"> • position • alignment • completeness • free from damage or foreign objects • electrical continuity • component security 	
		1.12	Produce mechanical assemblies which comply with one of the following standards: <ul style="list-style-type: none"> • BS, ISO or BSEN standards and procedures • customer standards and requirements • company standards and procedures • specific system requirements 	
		1.13	Deal promptly and effectively with problems within their control and report those that cannot be solved	
2.	Know how to Assemble Electrical or Electronic Components to	2.1	Describe the specific safety precautions to be taken while carrying out the assembly (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)	

Mechanical Equipment	2.2	Describe the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility these requirements place on them	
	2.3	Describe the COSHH regulations with regard to the substances used in the assembly process	
	2.4	Describe the hazards associated with assembling electrical or electronic components to mechanical equipment, and how to minimise them and reduce any risks	
	2.5	Describe the personal protective equipment and clothing to be worn during the assembly activities	
	2.6	Explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken	
	2.7	Describe the general principles of electrical and electronic fitting techniques; the purpose and function of the components, including identification systems (such as colour codes, manufactures specification)	
	2.8	Describe the preparations to be undertaken on the electrical or electronic components prior to fitting them into the assembly	
	2.9	Describe the correct component handling procedures, including any relevant handling equipment	
	2.10	Describe the assembly and securing methods and procedures to be used, and the importance of adhering to these	
	2.11	Explain how the components are to be positioned, aligned and secured, and the tools and equipment that are used	
	2.12	Describe the importance of using the specified electrical or electronic components and securing devices for the assembly, and why they must not use substitutes	
	2.13	Describe the quality control procedures to be followed during the assembly operations	
	2.14	Explain how to conduct any necessary checks to ensure the accuracy, position, security, function, completeness and electrical continuity of the assembly	
	2.15	Explain how to detect assembly defects (such as ineffective joining techniques, component damage), and what to do to rectify them	
	2.16	Explain how to check that the tools and equipment to be used are in a safe and serviceable condition	
	2.17	Describe the importance of ensuring that all tools are used correctly and within their permitted operating range	
	2.18	Describe the importance of ensuring all tools, equipment and components are accounted for and returned to their correct location on completion of the assembly activities	
	2.19	Describe the things that can go wrong with the assembly operations, and what to do if they occur	

2.20

Describe the extent of their own authority and to whom they should report if they have problems that they cannot resolve



Level 2 Unit – Assembling Pipework Components to
Mechanical Equipment

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to assemble and fit pipework components to mechanical equipment, in accordance with approved procedures. The learner will be required to check that specified components are available and fit for purpose, to obtain all relevant and current documentation, to obtain the tools and equipment required for the assembly operations and to check that they are in a safe and usable condition. In carrying out the assembly operations, the learner will be required to follow company procedures and specified assembly techniques, in order to assemble the pipework and components and to fit them to the mechanical equipment.

The assembly activities will also include making all necessary checks and adjustments to ensure that the pipework and components are correctly orientated, positioned and aligned and that all fasteners are tightened to the correct torque and the assembled parts are checked for completeness.

Unit introduction

The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the assembly activities, materials or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will be sufficient to provide a good understanding of their work and will provide an informed approach to applying pipework fitting and assembly techniques and procedures. The learner will have an understanding of the mechanical product being assembled, and its application, and will know about the equipment, relevant components and joining techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the assembly activities. The learner will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment

To achieve this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit through a variety of assessment methods appropriate to the delivery environment.

Unit Reference Number		D/600/6045
Qualification Framework		RQF
Title		Assembling Pipework Components to Mechanical Equipment
Unit Level		Level 2
Guided Learning Hours		151
Unit Credit Value		49
Unit Grading Structure		Pass / Fail

Learning Outcome		Assessment Criteria - The learner can		Criteria expansion
1.	Assembling Pipework Components to Mechanical Equipment	1.1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines	
		1.2	Follow relevant specifications for the component to be produced	
		1.3	Obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition	
		1.4	Shape the materials using appropriate methods and techniques	
		1.5	Cut and finish material to the marked out shape, using four of the following tools: <ul style="list-style-type: none"> • tin snips • bench shears • guillotine • hacksaw • band saw • hand power tools (drill, nibbling) • pillar drill • files • punch/cropping machine • laser • thermal devices • water cutter 	
		1.6	Perform cutting operations to produce all of the following shapes: <ul style="list-style-type: none"> • straight cuts • external and internal curved contours • round holes 	
		1.7	Use sheet metal of various thicknesses, up to and including 3 mm, for two appropriate materials and two thicknesses from the following:	

		<ul style="list-style-type: none"> • hot-rolled mild steel • cold-rolled mild steel • coated mild steel (such as primed, tinned, galvanised) • stainless steel • aluminium • brass • copper 		
		1.8	Check that all the required shaping operations have been completed to the required specification	
		1.9	Produce cut and shaped components which meet all the following quality and accuracy standards: <ul style="list-style-type: none"> • dimensionally accurate (to drawing or specifications) • free from distortion • free from sharp edges, slivers or burrs 	
		1.10	Deal promptly and effectively with problems within their control and report those that cannot be solved	
2.	Know how to Assemble Pipework Components to Mechanical Equipment	2.1	Explain the specific safety precautions to be taken when working with sheet metal equipment and materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)	
		2.2	Describe the personal protective clothing and equipment to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)	
		2.3	Describe the correct methods of moving or lifting sheet metal	
		2.4	Explain the safe working practices and procedures to be observed when using manual and power-operated tools	
		2.5	Describe the hazards associated with fabrication work (such as using dangerous or badly maintained tools and equipment, operating guillotines, and when using hand and bench shears), and how they can be minimised	
		2.6	Describe the procedures for obtaining the necessary drawings and specifications, and how to check that they are the latest issue	
		2.7	Explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)	
		2.8	Describe how to interpret the marking out conventions on the materials to be cut and shaped (such as cutting lines, centre lines)	
		2.9	Describe the tools and techniques available for cutting and shaping sheet metal (such as tin snips, bench shears, guillotines, portable power tools, bench drills, saws)	

	2.10	Describe what preparations may have to be carried out on the material prior to cutting it	
	2.11	Describe the material characteristics and process considerations that need to be taken into account when cutting and shaping sheet metal	
	2.12	Describe the use and care of tools and equipment, including checks that need to be made to ensure that the tools are fit for purpose (sharp, undamaged, plugs and cables secure and free from damage, machine guards or safety devices operating correctly)	
	2.13	Explain the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations	
	2.14	Describe the problems that can occur with cutting and shaping sheet metal, and explain how these can be avoided	
	2.15	Describe the importance of using the machine guards and safety protection equipment at all times	
	2.16	Describe the inspection techniques that can be applied to check that shape and dimensional accuracy are to specification and within acceptable limits	
	2.17	Describe the extent of their own authority and explain whom they should report to if they have problems that they cannot resolve	
	2.18	Explain the reporting lines and procedures, line supervision and technical experts	