

Qualification Pack



CNC Operator Turning

QP Code: CSC/Q0115

Version: 2.0

NSQF Level: 4

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CSC/Q0115: CNC Operator Turning

Brief Job Description

A CNC Operator - Turning is responsible for setting up the CNC turning machine, workholding devices, and tooling; loading the machine operating programs; conducting trial runs and correcting faults to ensure the machined components meet the required specifications and quality standards.

Personal Attributes

The individual must be physically fit to work for long durations. The person must have attention to detail, basic numerical ability, problem-solving and coordination skills. The individual must have basic skills in oral and written communication.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [CSC/N1335: Follow the health and safety practices at work](#)
2. [CSC/N1336: Coordinate with co-workers to achieve work efficiency](#)
3. [CSC/N0120: Set up the CNC turning machine for operations](#)
4. [CSC/N0115: Carry out turning operations using the CNC machine](#)

Qualification Pack (QP) Parameters

| | |
|------------|--|
| Sector | Capital Goods |
| Sub-Sector | Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods |
| Occupation | Machining |
| Country | India |
| NSQF Level | 4 |

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|---|---|
| Aligned to NCO/ISCO/ISIC Code | NCO-2015/7223.40 |
| Minimum Educational Qualification & Experience | <p>8th Class Pass + ITI (2years) with 2 years of experience in the relevant field</p> <p>OR</p> <p>10th Class Pass with 2 years of experience in the relevant field</p> <p>OR</p> <p>10th Class Pass + ITI (1 year) with 1 year experience in the relevant field</p> <p>OR</p> <p>10th Class Pass + ITI (2 years)</p> <p>OR</p> <p>12th Class Pass with 6 months of experience in the relevant field</p> <p>OR</p> <p>Certified in NSQF-L3 Operator - Conventional Turning with 2 years of experience in the relevant field</p> |
| Minimum Level of Education for Training in School | |
| Pre-Requisite License or Training | NA |
| Minimum Job Entry Age | 18 Years |
| Last Reviewed On | |
| Next Review Date | |
| Deactivation Date | |
| NSQC Approval Date | |
| Version | 2.0 |
| Reference code on NQR | 2015/CCM/GCSC/00004 |
| NQR Version | 1.0 |

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CSC/N1335: Follow the health and safety practices at work

Description

This OS unit is about following the appropriate health and safety practices at work. It covers responsibilities towards self and others to ensure a safe work environment.

Scope

This unit/task covers the following:

- Maintain personal health and safety
- Assist in hazard management
- Check the first aid box, firefighting and safety equipment
- Assist in waste management
- Follow the fire safety guidelines
- Follow the emergency and first-aid procedures
- Carry out relevant documentation and review

Elements and Performance Criteria

Maintain personal health and safety

To be competent, the user/individual on the job must be able to:

- PC1.** follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask
- PC2.** check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them
- PC3.** select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions
- PC4.** follow the recommended techniques while lifting and moving heavy objects to avoid injury
- PC5.** follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment

Assist in hazard management

To be competent, the user/individual on the job must be able to:

- PC6.** identify existing and potential hazards at work
- PC7.** assess the potential risks and injuries associated with the identified hazards
- PC8.** coordinate with the supervisor or other relevant personnel to prevent or minimise the identified hazards
- PC9.** handle hazardous materials safely and store them in the designated storage

Check the first aid box, firefighting and safety equipment

To be competent, the user/individual on the job must be able to:

- PC10.** check the first aid box to ensure it is updated with the relevant first aid supplies
- PC11.** check and test the firefighting and various safety equipment to ensure they are in usable condition
- PC12.** coordinate with the supervisor for the repair and replacement of firefighting and safety equipment

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Assist in waste management

To be competent, the user/individual on the job must be able to:

- PC13.** segregate waste into appropriate categories
- PC14.** recycle the recyclable waste appropriately
- PC15.** dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations

Follow the fire safety guidelines

To be competent, the user/individual on the job must be able to:

- PC16.** use the appropriate type of fire extinguisher to extinguish different types of fires safely
- PC17.** follow the recommended practices for a safe rescue during a fire emergency
- PC18.** coordinate with the fire department to request assistance to extinguish a serious fire

Follow the emergency and first-aid procedures

To be competent, the user/individual on the job must be able to:

- PC19.** follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety
- PC20.** follow the recommended practices to minimise loss to organisational property during an emergency
- PC21.** follow the recommended procedure to free a person from electrocution
- PC22.** administer appropriate first aid to the injured personnel
- PC23.** perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest
- PC24.** coordinate with the emergency services to request medical assistance for seriously injured/ill personnel requiring professional medical attention or hospitalisation

Carry out relevant documentation and review

To be competent, the user/individual on the job must be able to:

- PC25.** carry out appropriate documentation following a health and safety incident at work, including all the required information
- PC26.** coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident
- PC27.** assist in implementing appropriate changes to improve the health and safety conditions at work

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask
- KU2.** the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them
- KU3.** the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions
- KU4.** the recommended techniques to be followed while lifting and moving heavy objects to avoid injury
- KU5.** the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment
- KU6.** the importance and process of identifying existing and potential hazards at work
- KU7.** the process of assessing the potential risks and injuries associated with the various hazards

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- KU8.** how to prevent or minimise different types of hazards
- KU9.** how to handle and store hazardous materials safely
- KU10.** the importance of ensuring the first aid box is updated with the relevant first aid supplies
- KU11.** the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition
- KU12.** the criteria for segregating waste into appropriate categories
- KU13.** the appropriate methods for recycling the recyclable waste
- KU14.** the process of disposing of the non-recyclable waste safely and the applicable regulations
- KU15.** use of different types of fire extinguishers to extinguish different types of fires
- KU16.** the recommended practices to be followed for a safe rescue during a fire emergency
- KU17.** how to request assistance from the fire department to extinguish a serious fire
- KU18.** the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property
- KU19.** common health and safety hazards present in a work environment, associated risks, and how to mitigate them
- KU20.** safe working practices to be followed while working at various hazardous sites and using electrical equipment
- KU21.** the importance of ensuring easy access to firefighting and safety equipment
- KU22.** the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases
- KU23.** various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents
- KU24.** different methods of extinguishing fire
- KU25.** different materials used for extinguishing fire, such as sand, water, foam, CO₂, dry powder, etc.
- KU26.** the applicable rescue techniques to be followed during a fire emergency
- KU27.** the importance of placing safety signs and instructions at strategic locations in a workplace and following them
- KU28.** different types of first aid treatment to be provided for different types of injuries
- KU29.** potential injuries associated with incorrect manual handling
- KU30.** how to move an injured person safely
- KU31.** various hazards associated with the use of various machinery, tools, implements, equipment and materials
- KU32.** the importance of ensuring no obstruction and free access to fire exits
- KU33.** how to free a person from electrocution safely
- KU34.** how to administer appropriate first aid to an injured person
- KU35.** how to perform Cardiopulmonary Resuscitation (CPR)
- KU36.** the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation
- KU37.** the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included
- KU38.** the importance and process of reviewing the health and safety conditions at work regularly or following an incident
- KU39.** the importance and process of implementing appropriate changes to improve the health and safety conditions at work

Generic Skills (GS)

User/individual on the job needs to know how to:



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- GS1. maintain work-related notes and records
- GS2. communicate clearly and politely with co-workers and clients
- GS3. read the relevant literature to get the latest updates about the field of work
- GS4. listen attentively to understand the information being shared
- GS5. plan and prioritise tasks to ensure timely completion
- GS6. take quick decisions to deal with workplace emergencies and accidents
- GS7. identify possible disruptions to work and take appropriate preventive measures
- GS8. coordinate with the co-workers to achieve the work objectives
- GS9. evaluate all possible solutions to a problem to select the best one

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National Occupational Standards (NOS) Parameters

| | |
|---------------------|--|
| NOS Code | CSC/N1335 |
| NOS Name | Follow the health and safety practices at the work |
| Sector | Capital Goods |
| Sub-Sector | Machine Tools, Process Plant Machinery, Dies, Moulds and Press Tools, Electrical and Power Machinery, Plastics Manufacturing Machinery, Light Engineering Goods, Textile Manufacturing Machinery |
| Occupation | Machining |
| NSQF Level | 3 |
| Credits | TBD |
| Version | 2.0 |
| Last Reviewed Date | |
| Next Review Date | |
| Deactivation Date | |
| NSQC Clearance Date | |

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CSC/N1336: Coordinate with co-workers to achieve work efficiency

Description

This OS unit is about working in coordination with co-workers to achieve the work objectives efficiently. It also covers practising inclusion at work.

Scope

This unit/task covers the following:

- Work effectively with co-workers
- Communicate effectively with co-workers
- Practice inclusion at work

Elements and Performance Criteria

Work effectively with co-workers

To be competent, the user/individual on the job must be able to:

- PC1.** plan daily tasks at work to ensure their timely completion and efficient use of time
- PC2.** carry out work responsibilities adhering to the limits of authority
- PC3.** follow the supervisor's instructions to ensure adherence to the applicable quality standards and timescales
- PC4.** coordinate with the co-workers to achieve the work objectives efficiently
- PC5.** prepare the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically
- PC6.** coordinate with the supervisor or relevant personnel to deal with out of authority tasks and concerns
- PC7.** mentor and assist subordinates in the execution of their work responsibilities
- PC8.** identify possible disruptions to work through coordination with the relevant stakeholders and take appropriate preventive measures
- PC9.** use various resources efficiently to ensure maximum utilisation and minimum wastage
- PC10.** follow the recommended practices to avoid and resolve conflicts at work
- PC11.** follow the relevant organisational policies to ensure disciplined behaviour with maximum productivity at work

Communicate effectively with co-workers

To be competent, the user/individual on the job must be able to:

- PC12.** follow the organisational policy for the efficient and timely dissemination of information to the authorised personnel
- PC13.** communicate clearly and politely to ensure effective communication with co-workers
- PC14.** follow the appropriate techniques for active listening during interactions

Practice inclusion at work

To be competent, the user/individual on the job must be able to:

- PC15.** empathise with Persons with Disabilities (PwD)
- PC16.** adopt gender-neutral behaviour at work

Knowledge and Understanding (KU)

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The individual on the job needs to know and understand:

- KU1.** the importance and process of effective communication in the workplace
- KU2.** the barriers to effective communication and how to overcome them
- KU3.** the importance of teamwork in an organisation's and individual's success
- KU4.** the importance of active listening in the work environment
- KU5.** the appropriate techniques to be followed for active listening
- KU6.** importance of tone and pitch in effective communication
- KU7.** importance of avoiding casual expletives and unpleasant terms while communicating professional circles
- KU8.** the importance of maintaining discipline and ethical behaviour at work
- KU9.** the common reasons for interpersonal conflict and how to resolve them
- KU10.** the importance of developing effective working relationships for professional success
- KU11.** how expressing and addressing grievances appropriately and effectively
- KU12.** the importance and process of planning daily tasks to ensure their timely completion and efficient use of time
- KU13.** the importance of adhering to the limits of authority at work
- KU14.** the importance of following the applicable quality standards and timescales at work
- KU15.** the importance of coordinating with the co-workers to achieve the work objectives efficiently
- KU16.** the relevant documentation requirements
- KU17.** the importance of providing appropriate information clearly and systematically in work documents
- KU18.** the escalation matrix to be followed to deal with out of authority tasks and concerns
- KU19.** the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities
- KU20.** how to identify possible disruptions to work prevent them
- KU21.** how to use various resources efficiently to ensure maximum utilisation and minimum wastage
- KU22.** the recommended practices to be followed at work to avoid and resolve conflicts at work
- KU23.** the importance and process of efficient and timely dissemination of information to the authorised personnel
- KU24.** how to communicate clearly and politely to ensure effective communication
- KU25.** the importance of following the recommended practices to ensure an inclusive environment for PwD and all genders at work

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** maintain work-related notes and records
- GS2.** read work-related and other relevant literature
- GS3.** communicate politely and -professionally
- GS4.** listen attentively to understand the information or instructions being shared
- GS5.** plan and prioritise tasks to ensure timely completion
- GS6.** take prompt decisions to deal with workplace emergencies and accidents
- GS7.** evaluate all possible solutions to a problem to select the best one

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National Occupational Standards (NOS) Parameters

| | |
|---------------------|--|
| NOS Code | CSC/N1336 |
| NOS Name | Coordinate with co-workers to achieve work efficiency |
| Sector | Capital Goods |
| Sub-Sector | Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods |
| Occupation | Machining |
| NSQF Level | 3 |
| Credits | TBD |
| Version | 2.0 |
| Last Reviewed Date | |
| Next Review Date | |
| Deactivation Date | |
| NSQC Clearance Date | |

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CSC/N0120: Set up the CNC turning machine for operations

Description

This OS unit is about setting up CNC turning machine for carrying out turning operations on a variety of components as per the given specifications.

Scope

This unit/ task covers the following:

- Prepare for setting the CNC turning machine
- Set the CNC turning machine

Elements and Performance Criteria

Prepare for setting the CNC turning machine

To be competent, the user/individual on the job must be able to:

- PC1.** use the relevant information from engineering drawings concerning the work to be undertaken for setting up the CNC machine
- PC2.** determine the job specifications by referring to job instruction sheet/job card, component drawing, work drawing, planning documentation; quality control documents; operation sheets, component drawings; approved sketches/illustrations, process drawing, etc.
- PC3.** analyse the component drawings and approved sketches/ illustrations/ reference charts/ tables/ graphs/ machining/ assembly drawings to determine the machining requirements
- PC4.** extract the relevant information such as tapping sizes and threads; feeds and speeds; component ratings; machining symbols and tolerances from reference charts, tables, graphs
- PC5.** check the process sheet and match it with the received drawings and other specifications
- PC6.** identify the tool requirements from the tooling layout and assess their suitability
- PC7.** check the availability of required cutting, measuring and hand tools
- PC8.** select the appropriate work holding/ fixturing device as per the job requirement
- PC9.** ensure the correct and latest part program is uploaded onto the CNC system
- PC10.** check the runout of chuck and the taper of tailstock are as recommended
- PC11.** pre-set the tooling appropriately using setting jigs/fixtures

Set the CNC turning machine

To be competent, the user/individual on the job must be able to:

- PC12.** check the measuring equipment to ensure they are calibrated and approved for use
- PC13.** check the tools and fixtures to ensure they are calibrated appropriately, and free from damage
- PC14.** mount tools in the correct position in the tool holder, turrets, magazine or carousel
- PC15.** check that tools have the required tool number in relation to the operating program
- PC16.** enter all the relevant tool data in the operating program and also part-program for cutting parts using the appropriate commands
- PC17.** set tool datum, position, length, offset and radius compensation, maintaining the recommended margin for error rectification
- PC18.** mount the work holding device/fixture onto the machine and set it according to the machine datum and reference points
- PC19.** set the machine tool operating parameters such as hydraulic pressure and clamping according to the component requirements
- PC20.** set the CNC machine in the correct operating mode, and enter the tooling data by accessing

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the program edit facility

- PC21.** conduct trial runs using single block run, dry run, and feed and speed override controls
- PC22.** check the geometrical accuracies of component such as diameter on multiple points, taper, surface finishing, groove depths and widths, drill depth, Outer Diameter (OD)/Inner Diameter (ID), threading quality and dimensions
- PC23.** check the allowable grinding margin on OD and ID
- PC24.** prove the program tool in single block mode and transfer the program to the machine
- PC25.** conduct multiple trial runs before allowing the machine to operate in full program run mode, and make appropriate adjustments to offsets to ensure accuracy in the critical parameters of the components to be machined
- PC26.** carry out necessary documentation as per the organisational procedure for the handover of the machine
- PC27.** follow the appropriate troubleshooting steps to resolve issues experienced with setting up of the tooling, work holding devices and proving the program
- PC28.** check if the CNC turning/lathe machine responds to emergency commands and actions
- PC29.** check the tools/ fixtures for damage during the prove-out
- PC30.** carry out appropriate documentation with respect to the setting of the machine and checks conducted
- PC31.** coordinate with an expert to resolve any issues encountered while setting up the CNC machine

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the importance of carrying out relevant documentation with respect to the setting of the CNC turning machine
- KU2.** the relevant environmental regulations that must be observed
- KU3.** the relevant safe working practices to be followed such as ensuring that no one operates the CNC turning machine while it is being set
- KU4.** how to fit and adjust machine guards on the CNC turning machine
- KU5.** the importance of operating a CNC turning machine in closed-door conditions
- KU6.** the importance of ensuring the tooling is free from any workpiece before starting the machine
- KU7.** how to secure the workpiece on the CNC turning machine
- KU8.** use of the relevant Personal Protective Equipment (PPE) and applicable safety precautions to be taken
- KU9.** the importance of determining the job specifications by referring to a valid source before setting the CNC turning machine
- KU10.** the applications of CNC Turning machines
- KU11.** the terminology relevant to CNC turning operations
- KU12.** the importance of ensuring the suitability of workpieces/materials and consumables for the specified job and related procedures
- KU13.** the importance and process of checking that tools and equipment are in a safe and usable condition
- KU14.** different workholding methods and devices used on CNC machines such as chucks with hard jaws, chucks with soft jaws, fixtures, drive centres, collet chucks, faceplates, magnetic/pneumatic devices, etc.
- KU15.** how to set the workholding devices
- KU16.** appropriate machine specifications such as power, Revolutions Per Minute (RPM), torque, cutting speed, etc.

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- KU17.** how to set and use various tools such as turning tool (OD and ID), grooving tool (OD and ID), parting tool, threading tool, form tools, centre drills, twist/insert drills, reamers
- KU18.** use of various tool holding devices
- KU19.** the method of mounting and securing the cutting tools to the tool holders appropriately
- KU20.** the advantages of using pre-set tooling, and how to set the tooling using setting jigs/fixtures
- KU21.** the use of tool posts, magazines and carousels
- KU22.** how to position and identify the tools in relation to the operating program
- KU23.** various errors messages displayed by a CNC machine and the appropriate action to be taken
- KU24.** the importance of proving the program and the process of doing it
- KU25.** how to part-program for cutting a part; related commands and how to transfer the program to the CNC machine
- KU26.** the applicable quality control procedures, inspection checks to be carried out, and the equipment required for the purpose
- KU27.** various materials used in common engineering applications, such as ferrous and non-ferrous metals, and non-metals e.g. plastic
- KU28.** how to identify materials by their physical properties

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** maintain work-related notes and records
- GS2.** read work-related and other relevant literature
- GS3.** communicate politely and -professionally
- GS4.** listen attentively to understand the information or instructions being shared
- GS5.** plan and prioritise tasks to ensure timely completion
- GS6.** take prompt decisions to deal with workplace emergencies and accidents
- GS7.** evaluate all possible solutions to a problem to select the best one

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National Occupational Standards (NOS) Parameters

| | |
|---------------------|--|
| NOS Code | CSC/N0120 |
| NOS Name | Set up the CNC turning machine for operations |
| Sector | Capital Goods |
| Sub-Sector | Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods |
| Occupation | Machining |
| NSQF Level | 4 |
| Credits | TBD |
| Version | 2.0 |
| Last Reviewed Date | |
| Next Review Date | |
| Deactivation Date | |
| NSQC Clearance Date | |

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CSC/N0115: Carry out turning operations using the CNC machine

Description

This OS unit is about operating the Computer Numerically Controlled (CNC) lathe machines to perform turning operations i.e. removal of material from rotating workpieces as per the given specifications.

Scope

This unit/task covers the following:

- Prepare for carrying out turning operations
- Carry out turning operations
- Use resources optimally

Elements and Performance Criteria

Prepare for carrying out turning operations

To be competent, the user/individual on the job must be able to:

- PC1.** select the appropriate Personal Protective Equipment (PPE) for the turning operations
- PC2.** assess the hazards at the worksite and coordinate with the supervisor or relevant personnel to deal with them
- PC3.** check the process sheet and match it with the received drawings and other specifications
- PC4.** check the availability of the required tools and measuring instruments
- PC5.** select the relevant hand and mechanised tools and equipment and check them to ensure they are safe to be used
- PC6.** repair or replace the worn-out PPE, tools and equipment, as appropriate
- PC7.** determine the job specifications by referring to job instruction sheet/job card, component drawing, work drawing, planning documentation; quality control documents; operation sheets, component drawings; approved sketches/illustrations, process drawing, etc.
- PC8.** select the appropriate raw materials or components for the turning operations after checking it to ensure it has the required characteristics
- PC9.** check the post-machining sheet to determine if the component meets the applicable quality standards from previous machining operations
- PC10.** coordinate with the supervisor or relevant personnel for the correction of incorrect and inconsistent information in the job specification documents, following the applicable organisational procedure
- PC11.** prepare the work area for the turning operations as per the applicable procedure or operational specifications
- PC12.** check for safe resting of the component on resting pads and clamping load of fixture
- PC13.** carry out daily maintenance of turning machine, following the maintenance checklist and applicable procedures
- PC14.** check the availability of required workpieces/raw materials, consumables, cutting, measuring and hand tools as per the job requirements
- PC15.** check the components before use to ensure they are free from foreign objects, dirt or other contamination
- PC16.** conduct the appropriate preliminary checks on the CNC turning machine as per the relevant checklist to ensure its readiness for use
- PC17.** carry out minor repair and maintenance on the CNC turning machine and coordinate with an expert to resolve any complex issues
- PC18.** check to ensure all the measuring instruments are calibrated and approved for use

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- PC19.** set workpieces as per the job requirements using appropriate positioning or holding devices and support mechanisms
- PC20.** check that the operating program is at the correct start point and the tool is at a safe position, clear of the part

Carry out turning operations

To be competent, the user/individual on the job must be able to:

- PC21.** load and unload component(s) using the appropriate fixtures or work holding devices as appropriate
- PC22.** check the correctness of the program by conducting a dry run and single block check
- PC23.** carry out first part cutting trial by setting tool offsets to get oversize part
- PC24.** identify abnormal noises coming from the machine and component, and adjust the feed and Revolutions Per Minute (RPM), as required
- PC25.** measure the critical parameters of the machined components without removing them from the machine, such as linear dimensions, slots, flatness, surface finish, etc.
- PC26.** correct the offsets based on the measurements by accessing the program edit facility and enter the tooling data
- PC27.** adhere to the information provided in the reference charts, tables, graphs, component drawing, engineering drawing, dimensioning and labelling data drawing
- PC28.** check the messages shown on the CNC machine's visual display regularly and take appropriate action
- PC29.** restart the program from the correct restart point when the machine is been stopped before the completion of the program
- PC30.** carry out a range of turning operations to ensure the machined components have the required features, faces, undercuts, profiles, holes, parting-off and threads, etc.
- PC31.** follow the appropriate machining sequence and procedures as per the job specifications
- PC32.** follow the manufacturer's instructions and organisational guidelines to deal with machine alarms and errors
- PC33.** inspect the machine and machined components as per recommended frequency given in the inspection plan
- PC34.** record the measured values as per the organisational procedure and complete the post-machining inspection sheet
- PC35.** identify inconsistencies in dimensions due to tool wear and correct the offsets accordingly
- PC36.** adjust various machine settings according to the operations requirements, when required
- PC37.** identify the worn-out and damaged tools and equipment
- PC38.** repair or replace the worn tool and damaged tools and equipment, as appropriate
- PC39.** cut a trial part and adjust the tool offsets after each tool change
- PC40.** handle and store the raw material and finished components as per organisational policy
- PC41.** check the finished components to ensure they conform to the applicable specifications and quality standards
- PC42.** use the relevant Industry 4.0 manufacturing technologies to ensure interconnectivity, automation, machine learning, and real-time data collection and analysis
- PC43.** follow the manufacturer's instructions while operating the CNC turning machine
- PC44.** coordinate with the relevant personnel to resolve issues encountered with turning operations
- PC45.** store the machinery, tools and equipment at the designated location on the completion of turning operations
- PC46.** follow the organisational policy to ensure a safe and hygienic work area, such as safe isolation of machinery, removal and disposal of waste, regular maintenance of machinery, use of relevant PPE

Use resources optimally

To be competent, the user/individual on the job must be able to:

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PC47. use electricity and other resources optimally in various tasks and processes

PC48. connect electrical tools and equipment safely and turn them off when they are not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** applicable documentation requirements in the job role
- KU2.** the concepts and benefits of Industry 4.0 and Industrial Internet of Things (IIoT)
- KU3.** the appropriate CNC turning procedures, safe working practices, and environmental regulations to be observed
- KU4.** how to isolate the machine before mounting work holding devices and tooling
- KU5.** the process of fitting and adjusting machine guards
- KU6.** the importance of securing the workpiece before starting the machine
- KU7.** various hazards associated with the use of CNC turning machine and how to minimise them, such as revolving machine parts; airborne and hot metal particles; sharp cutting tools; lifting and handling of work holding devices; burrs and sharp edges on component; use of power-operated chucks, etc.
- KU8.** the use of relevant Personal Protective Equipment (PPE) during the CNC turning activities, such as overalls, face shields, safety glasses, steel toe boots, gloves made from the recommended grade of rubber, etc.
- KU9.** how to use the relevant safety mechanism on the CNC turning machine, such as emergency stop button/ brakes
- KU10.** the valid sources to get the job specifications, such as job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor, etc.
- KU11.** the terminology relevant to CNC turning operations
- KU12.** how to read and interpret first and third angle component drawings
- KU13.** how to extract relevant information from engineering drawings, such as dimensioning and labelling data orthographic, isometric, first and third angle projections, sectional view data, reference points, lines, edges and surfaces
- KU14.** the symbols and conventions appropriate to the relevant ISO standards
- KU15.** the features and working parts of a CNC turning machine
- KU16.** the preliminary checks to be conducted on the CNC turning machine, such as machine cleanliness, lubricant and coolant levels, functioning of sub-systems, etc.
- KU17.** the relevant information about thread sizes; feeds and speeds; machining symbols and tolerances; surface finish symbols; etc.
- KU18.** the importance of following the established machining sequences and procedures
- KU19.** the importance of checking the process sheet and matching it with the received drawings and other material
- KU20.** the importance and process of checking the quality of machined components according to the post-machining sheet to ensure conformance to the applicable quality standards
- KU21.** how to run the part program in single block mode and the importance of checking the tool condition after each operation
- KU22.** the importance of maintaining the recommended coolant levels and positioning the coolant nozzles appropriately
- KU23.** the importance of checking the sequence of the program as per the process sheet
- KU24.** the importance of checking for the presence of the appropriate tool in the relevant pocket of Automatic Tool Changer (ATC)
- KU25.** how to identify abnormal noises coming from the machine and component
- KU26.** how to adjust the feed and Revolutions Per Minute (RPM)

Qualification Pack

- KU27.** the importance of checking the condition of tools being used in machining at appropriate intervals during the process
- KU28.** how to identify inconsistencies in the dimensions due to tool wear and the process of correcting the offsets accordingly
- KU29.** how to adjust the machine settings to maintain the desired accuracy
- KU30.** the process of sharpening or replacing the worn-out/ damaged tools, using the necessary equipment
- KU31.** the importance of modifying the tool offsets according to the new tools replacing them
- KU32.** the relevant safety guidelines to be following while sharpening/ replacing the worn-out/damaged tools
- KU33.** the importance of ensuring the suitability of workpieces/materials and consumables for the specified job and related procedures
- KU34.** the use of relevant tools and equipment used for machining operations on CNC machines
- KU35.** the importance and procedure to ensure that tools and equipment are in a safe and usable condition
- KU36.** various CNC turning operations such as turning (OD and ID), facing, grooving (OD and ID), face grooving, thread cutting (OD and ID), drilling, boring and tapping
- KU37.** the appropriate techniques and procedures for carrying out specific turning operations on a CNC lathe
- KU38.** the importance of following the correct procedures according to the raw material and form of supply/shapes
- KU39.** the form of supply/shapes or raw material such as square/rectangular (e.g. bar stock, sheet material, machined components); circular/cylindrical (e.g. bar stock, tubes, turned components, flat discs); irregular shapes/profile (e.g. castings, forgings, odd-shaped components)
- KU40.** various error messages displayed on a CNC turning machine and the appropriate corrective action to be taken
- KU41.** the importance of securing the workpieces/raw material correctly using the appropriate devices and mechanisms
- KU42.** the importance of setting the work holding device according to the machine axis and reference points
- KU43.** the implications of common problems encountered during CNC turning operations and how to resolve them
- KU44.** the process of checking the machined components against the relevant quality standards, such as components free from false tool cuts, burrs and sharp edges; recommended dimensions and tolerances
- KU45.** various ferrous and non-ferrous metals such as steel, stainless steel, cast iron, aluminium, aluminium alloys, copper and copper alloys machined using CNC turning machine and their machinability
- KU46.** the metric systems of measurement
- KU47.** the absolute and incremental systems of tool positioning and offsetting
- KU48.** the relevance and effect machine zero, workpiece zero, work offsets, tool offsets in the CNC program
- KU49.** the necessity and effects of not using tool nose radius compensation
- KU50.** use of High-speed steels, Tungsten carbide, Ceramic and Diamond indexable tips, and factors which determine their selection and use such as hardness, cutting characteristics, tolerances to be achieved, component surface finish, and component specifications
- KU51.** the use of various work holding devices such as tailstock, steady rest, chucks with hard jaws, chucks with soft jaws, fixtures, drive centres, collet chucks, faceplates, magnetic/pneumatic devices, etc.
- KU52.** the 1st and 2nd setup operation
- KU53.** how to decide holding length and jaw pressure setting

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- KU54.** the importance of conducting a cutting trial
- KU55.** the process of conducting trial dry run and single block checks
- KU56.** how to set cutting with offset adjustment
- KU57.** the parameters to be checked before operating CNC turning machine in auto mode dimensions and surface finishes
- KU58.** the importance of conducting periodic checks and maintenance on the machine such as replenishing the coolant; cleaning the machine; removing and disposing of swarf, etc.
- KU59.** the importance of calculating and adhering to the estimated production cost, machine hour rate, raw material cost, tool cost, coolant cost, overheads, cycle time, idle time, cost of machine idling, part rejection cost, etc.
- KU60.** the process of selecting the cutting tools,
- KU61.** the chip breaker geometry
- KU62.** the process of selecting the appropriate cutting tool catalogues such as turning tool (OD and ID), grooving tool (OD and ID), parting tool, threading tool, form tools, centre drills, twist/insert drills and reamers
- KU63.** the relationship between surface finish, tool nose radius and feed rate
- KU64.** the factors that affect feed and speed, such as type and condition of material, work-holding method, tooling, tolerance and finish to be achieved
- KU65.** the impact of depth of cut on chatter and surface finish
- KU66.** the importance of leaving the work area and machine in a safe condition on the completion of daily activities
- KU67.** the safe conditions to be ensured concerning the CNC machine, such as correct isolation; closure of operating programs, machine cleaning, and removal of any spilt cutting fluids
- KU68.** the importance of complying with the applicable health, safety, and environmental regulations

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to learn about the latest developments in the field of work
- GS3.** listen attentively to understand the information and instructions being shared
- GS4.** communicate politely and professionally
- GS5.** plan and schedule various tasks for efficient use of time
- GS6.** identify possible disruptions to work and take appropriate preventive measures
- GS7.** evaluate all possible solutions to a problem to select the best one

Qualification Pack

National Occupational Standards (NOS) Parameters

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|---------------------|--|
| NOS Code | CSC/N0115 |
| NOS Name | Carry out turning operations using the CNC machine |
| Sector | Capital Goods |
| Sub-Sector | Machine Tools, Process Plant Machinery, Dies, Moulds and Press Tools, Electrical and Power Machinery, Plastics Manufacturing Machinery, Light Engineering Goods, Textile Manufacturing Machinery |
| Occupation | Machining |
| NSQF Level | 4 |
| Credits | TBD |
| Version | 2.0 |
| Last Reviewed Date | |
| Next Review Date | |
| Deactivation Date | |
| NSQC Clearance Date | |

Qualification Pack

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for the Qualification Pack will be created by CGSC.
2. Performance Criteria (PC) have been assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
3. The assessment for the theory part will/may be based on knowledge bank of questions approved by CGSC.
4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selectedelectedive/option NOS/set of NOS.
5. Assessment Agencies will create Assessor Guides comprising of Theory and Practical Assessment Set and Guidelines for each examination/training centre (as per assessment criteria below). The same will be approved by CGSC for adequacy.
6. To successfully attain Certification on the Qualification Pack, the trainee must score a minimum of 70% in each Core NOS and a minimum of 50% in all non-core NOS. In addition, a candidate needs to attain a minimum overall pass percentage of 70% for certification.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level: 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|--------------|-----------------|---------------|------------|-------------|-----------|
| CSC/N1335: Follow the health and safety practices at work | | | | - | | 20 |

Qualification Pack

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|--|--|--|--|---|--|------------|
| CSC/N1336: Coordinate with co-workers to achieve work efficiency | | | | - | | 20 |
| CSC/N0120: Set up the CNC turning machine for operations | | | | - | | 30 |
| CSC/N0115: Carry out turning operations using the CNC machine | | | | - | | 30 |
| Total | | | | - | | 100 |

Qualification Pack

Acronyms

| | |
|-----------------|---|
| NOS | National Occupational Standard(s) |
| NSQF | National Skills Qualifications Framework |
| QP | Qualifications Pack |
| TVET | Technical and Vocational Education and Training |
| CNC | Computer Numerically Controlled |
| OD | Outside Diameter |
| ID | Inside Diameter |
| DTI | Dial Test Indicators |
| CO ₂ | Carbon Dioxide |
| CPR | Cardiac Pulmonary Resuscitation |
| PPE | Personal Protective Equipment |

Qualification Pack

Glossary

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| Sector | Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests. |
| Sub-sector | Sub-sector is derived from a further breakdown based on the characteristics and interests of its components. |
| Occupation | Occupation is a set of job roles, which perform similar/ related set of functions in an industry. |
| Job role | Job role defines a unique set of functions that together form a unique employment opportunity in an organisation. |
| Occupational Standards (OS) | OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts. |
| Performance Criteria (PC) | Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task. |
| National Occupational Standards (NOS) | NOS are occupational standards which apply uniquely in the Indian context. |
| Qualifications Pack (QP) | QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code. |
| Unit Code | Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N' |
| Unit Title | Unit title gives a clear overall statement about what the incumbent should be able to do. |
| Description | Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for. |
| Scope | Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required. |

Qualification Pack

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| Knowledge and Understanding (KU) | Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard. |
| Organisational Context | Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility. |
| Technical Knowledge | Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities. |
| Core Skills/ Generic Skills (GS) | Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles. |
| Electives | Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives. |
| Options | Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options. |