सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

Qualification Pack

Transforming the skill landscape

Technician Instrumentation

QP Code: CSC/Q0802

Version: 2.0

NSQF Level: 4

Capital Goods Skill Council || Awfice Space Solutions Pvt Ltd, 1st Floor, L-29, Outer Circle, Connaught place
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Contents

CSC/Q0802: Technician Instrumentation

Brief Job Description

A Technician Instrumentation is responsible for dismantling, repairing and replacing a range of instruments and faulty components in the instrumentation system. The individual is also responsible for setting up test equipment, troubleshooting components of instruments, calibrating them and also preparing service reports, documenting the repair and replacement of parts.

Personal Attributes

The individual must be physically fit to work for long durations with concentration. The person must have attention to detail, strong mathematical skills, and problem-solving skills with the ability to plan and perform own work independently. The individual must also be able to work in coordination with others to achieve the work objectives.

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/N0801: Calibrate the hydraulic, pneumatic, mechanical, electrical and electronic measuring and control equipment
4. CSC/N0803: Carry out maintenance activities on instrumentation and control equipment

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation

Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7311.67
Minimum Educational Qualification & Experience	8th Class Pass + ITI (2years) with 2 years of experience in the relevant field OR 10th Class Pass with 2 years of experience in the relevant field OR 10th Class Pass + ITI (1 year after Class 10th) with 1 year of experience in the relevant field OR 10th Class Pass + ITI (2 years after Class 10th) OR 12th Class Pass with 6 months of experience in the relevant field OR Certified in NSQF-L3 Operator - Calibration and Instrumentation with 2 years of experience in the relevant field
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/00133
NQR Version	1.0

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

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

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:

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

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	

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)

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

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	1.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

CSC/N0801: Calibrate the hydraulic, pneumatic, mechanical, electrical and electronic measuring and control equipment

Description

This OS unit is about the setting, adjusting and validating mechanical, pneumatic, hydraulic, electrical and electronic measuring and control instruments using the appropriate reference standards and following the approved standard procedures.

Scope

This unit/task covers the following:

- Prepare the testing equipment
- Test the measuring and control equipment
- Carry out fault management
- Calibrate the measuring and control equipment

Elements and Performance Criteria

Prepare the testing equipment

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

PC1. check various components in the testing equipment for faults, wear and tear or damage
PC2. repair or replace the faulty/ worn-out/ damaged components, as appropriate

Test the measuring and control equipment

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

PC3. determine the test requirements, following the standard procedure
PC4. plan the testing/calibration activities and prepare the appropriate schedules
PC5. check the relevant equipment such as leads and fasteners for faults, wear and tear or damage
PC6. repair or replace the equipment, as appropriate
PC7. inspect the instruments to ensure they are free from damage and unwanted foreign objects
PC8. carry out standard serviceability tests and calibration; special-to-type tests; operational/function checks, and gauge repeatability and reliability tests
PC9. perform the operational/function checks
PC10. conduct the gauge repeatability and reliability tests
PC11. follow the relevant statistical process control methods during the calibration/ testing activities
PC12. inspect and test the operation of instruments and systems using the relevant testing devices to diagnose faults
PC13. select the appropriate test application method and testing equipment after the inspection of instrumentation systems and equipment/components
PC14. determine the device isolation requirements and follow the appropriate device isolation methods
PC15. follow the appropriate test procedures and application principles to assess the operation of instrumentation systems and equipment/components
PC16. identify the instances when testing/calibration activities cannot be completed or defects outside the planned schedule, and report it to the relevant personnel

PC17. use the relevant Industry 4.0 manufacturing technologies to ensure interconnectivity, automation, machine learning, and real-time data collection and analysis
PC18. carry out relevant documentation manually and/ or electronically with respect to the testing/calibration activities

Carry out fault management

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

PC19. analyse and verify the test results against the operational specifications to identify and localise faults
PC20. identify the existing and potential faults following the applicable standard procedure, and report to the relevant personnel as per the SOP
PC21. determine the faulty conditions and plan corrective action
PC22. prepare and document an action plan as per the applicable procedures, including all the relevant information

Calibrate the measuring and control equipment

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

PC23. check the calibration of measuring and control equipment to ensure it is as per the manufacturers' specifications
PC24. calibrate the measuring and control equipment as per the applicable physical standards using the appropriate calibration tools, equipment and techniques
PC25. perform the zero span and range checks on indicators/controllers using the recommended configuration
PC26. carry out appropriate adjustments to the operational specifications using the relevant calibration devices and procedures
PC27. recommission the equipment according to the standard procedure
PC28. coordinate with the relevant personnel to resolve any issues beyond own area of competence or experience
PC29. monitor the problem and update the supervisor about the progress or any delays in resolving the problem
PC30. carry out relevant documentation as per the organisational procedure

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the concepts and benefits of Industry 4.0 and Industrial Internet of Things (IIoT)
KU2. the SOP for calibrating the measuring equipment and the relevant tools and equipment required for that
KU3. the SOP for commissioning the measuring equipment
KU4. the relevant calibration records to be maintained
KU5. the recommended specifications for measuring equipment and components for their optimum functioning
KU6. the use of relevant tools and equipment for checking measuring equipment for faults
KU7. the use of appropriate techniques to check the calibration of the measuring equipment for conformance to specifications
KU8. the process of calibrating the measuring equipment according to the appropriate physical standard
KU9. the process of recommissioning the measuring equipment

KU10. the appropriate checks to be made on the measuring equipment and the use of relevant tools and equipment for the purpose
KU11. how to resolve the common faults found in the measuring equipment
KU12. the impact of faults on the performance/accuracy of the measuring equipment
KU13. the hazards and controls relevant to calibrating the measuring equipment
KU14. the functionality of the measuring equipment and the recommended tolerance levels for calibration
KU15. the applicable instrumentation principles such as controlling density, level, flow, temperature, composition and arrangement of materials
KU16. the principles of hydraulic and pneumatic flow
KU17. the application principles for assessing the operation of instrumentation systems and equipment/components
KU18. the procedure and use of relevant equipment for inspecting and testing instrumentation system
KU19. the calibration procedures for instrumentation systems and equipment/ components
KU20. the purpose and functions of instrumentation system
KU21. the specifications of different types of instrumentation system and the acceptable deviations from specifications
KU22. the procedure for repairing faulty instrumentation system
KU23. the relevant techniques for dismantling, testing and reassembling an instrumentation system
KU24. the correct operation of the instrumentation system and the procedure for isolating instrumentation systems
KU25. different types of faults found in an instrumentation system and equipment components
KU26. the process for checking and verifying the operational function of the instrumentation system and equipment
KU27. the process of recording and completing service reports
KU28. the operational specifications of the instrumentation system and equipment
KU29. how to resolve variations between test results and operational specifications
KU30. the causes of common faults found in the instrumentation system and equipment components
KU31. the appropriate corrective action to be taken to rectify the causes of faults in the instrumentation systems and equipment
KU32. the process of correcting faults in the instrumentation system and equipment components
KU33. the importance and process of reporting the unresolved faults
KU34. the difference between real and potential faults
KU35. the process for documenting test and calibration results
KU36. the function and process of carrying out zero-and-span checks on instrumentation systems and equipment
KU37. the relevant equipment required to carry out the calibration of instrumentation systems and equipment
KU38. the instrumentation control equipment to be checked for weight, such as mechanical system, load cells/strain gauges, transducers, etc.
KU39. the speed measurement and control equipment to be checked, such as mechanical governors, valves and valve mechanisms including control valves, valve actuators and positioners, etc.
KU40. use of various and testing and calibration tools such as pressure gauge, standard test gauge, micrometre, jigs and fixtures, insulation testers, calibrated weights, Vernier calliper, deadweight tester, manometer, gyroscope, etc.
KU41. the relevant documentation to be completed such as job card, progress report, incident report, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.
KU42. the relevant calibration records to be maintained
KU43. the measuring equipment specifications, their use, connections and components

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 get the latest updates about the field of work
GS3. communicate politely and professionally
GS4. listen attentively to understand the information being shared
GS5. plan and schedule tasks for efficient time management
GS6. identify possible disruptions to work and take appropriate preventive measures
GS7. take quick decisions to deal with workplace emergencies/ accidents
GS8. evaluate all possible solutions to a problem to select the best one

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0801
NOS Name	Calibrate hydraulic, pneumatic and mechanical measuring and control equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

CSC/N0803: Carry out maintenance activities on instrumentation and control equipment

Description

This OS unit is about carrying out maintenance activities on instrumentation and control equipment according to the approved procedures. It also covers resource optimisation.

Scope

This unit/task covers the following:

- Prepare for the maintenance activities
- Carry out the maintenance activities
- Coordinate with the supervisor
- Use resource optimally

Elements and Performance Criteria

Prepare for the maintenance activities

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

PC1. prepare and update the relevant maintenance schedules and plans
PC2. perform appropriate risk assessments before testing and maintenance activities
PC3. coordinate with the operations and production teams to ensure the availability of critical systems and spares parts

Carry out the maintenance activities

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

PC4. use the correct and approved version of the company and/or manufacturer's drawings and maintenance documentation
PC5. follow the instructions in manufacturers' manuals to perform test and maintenance activities
PC6. follow the recommended maintenance schedules for critical systems, logging all repairs and inspections
PC7. carry out the maintenance activities on a range of instrumentation and control equipment, following the appropriate techniques and procedures
PC8. check the technical and mechanical systems to ensure their operation within the specified parameters
PC9. conduct instrumentation evaluation for hydraulic, pneumatic, mechanical, electrical and electronic measuring and control equipment
PC10. identify non-operational and malfunctioning systems in a timely manner to prevent any damage or loss
PC11. conduct the appropriate tests related to the functional performance of instruments, as required
PC12. test the instrumentation system operations to diagnose problems
PC13. use the appropriate scientific and analytic computer software, calculators, electronic probes, voltage and current meters to diagnose faults in circuitry
PC14. coordinate with the relevant personnel to evaluate the functioning of routine and emergency instruments and equipment
PC15. use the relevant testing devices to measure and control pressure, flow, temperature, level, motion, force, and chemical makeup

PC16. adjust the system components and replace the defective parts, as required
PC17. coordinate with engineers and process technicians to resolve the issues requiring their assistance
PC18. recommission the instrumentation system appropriately, to return it to service following repair and replacement activities
PC19. ensure compliance with the applicable policies, standards, and environmental and safety requirements while carrying out the required instrument maintenance or replacement activities
PC20. follow the applicable organisational procedure for the resolution of defects outside the planned schedule
PC21. carry out troubleshooting for test failures to determine root causes and develop processes to avoid repeat failure
PC22. carry out appropriate documentation to record the relevant information regarding the maintenance activities
PC23. follow the recommended practices to reduce the cost of repairing instruments and equipment while maintaining the quality of repairs

Coordinate with the supervisor

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

PC24. monitor the problem and update the superior about progress or any delays in resolving the problem
PC25. coordinate with the supervisor or relevant expert to resolve any issues which are out of authority or area of competence
PC26. identify appropriate improvements to the maintenance procedures and coordinate with the supervisor for their implementation

Use resources optimally

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

PC27. optimise the usage of electricity and other resources in various tasks and processes
PC28. connect the electrical tools and equipment safely, and turn them off when not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the appropriate documentation to be carried out, such as job card, work permit, risk assessment, sign-on/off, maintenance logs, etc.
KU2. the applicable isolation and lock-off procedures or permit-to-work procedure that applies
KU3. the relevant health and safety precautions to be taken during the maintenance process
KU4. how to minimise risks from the hazards associated with carrying out mechanical maintenance activities, such as handling oils, greases, stored pressure/force, use of complex tools and equipment
KU5. the importance of using the relevant Personal Protective Equipment (PPE) clothing during the maintenance activities
KU6. how to interpret drawings, specifications, manufacturers manuals and other documents needed during the maintenance process
KU7. the functioning of different process plants and the appropriate measuring and control equipment
KU8. the process to be adopted to establish the background of the fault

KU9. how to evaluate various types of information available for fault diagnoses such as operator-provided information, equipment self-diagnosis, and testing instrument measurements
KU10. use of various testing instruments such as multimetre, oscilloscope, logic probe, signal tracer, signal generator, etc.
KU11. use of various aids for fault diagnosis such as logic diagrams; fault analysis charts, flow charts or algorithms, manufacturers' manuals, probability charts, computer-aided test equipment, electronic aids, etc.
KU12. the application of various fault finding techniques such as half-split technique, input/output technique, injection and sampling, six-point technique, emergent sequence, unit substitution, function/performance testing; equipment self-diagnostics, etc.
KU13. how to evaluate sensory conditions i.e. sight, sound, smell, touch
KU14. how to analyse evidence and evaluate possible characteristics and causes of specific faults/problems
KU15. how to relate to the previous reports/records of similar fault conditions
KU16. how to evaluate the likely risk of running the equipment with the displayed fault, and the effects the fault could have on health and safety, and on the overall process or system
KU17. the process of handling and maintaining instrumentation test instruments
KU18. how to check that test instruments are within current calibration dates, and that they are free from damage and defects
KU19. the relevant precautions to be taken to prevent Electrostatic Discharge (ESD) damage to electronic circuits and components
KU20. basic principles of operation of the instrumentation and control equipment
KU21. how the instrumentation system functions and its operating sequence
KU22. the working purpose of individual units/components such as gauges and meters and how they interact
KU23. the importance of ensuring the control systems are isolated or put into manual control, and appropriate trip locks, keys or program overrides are inserted before removing any sensors or instruments from the system
KU24. the process of identifying and selecting instrument sensors, including how to identify their markings; calibration information; component values; operating parameters and working range
KU25. the appropriate way of fitting instruments to avoid faulty readings caused by head correction, poor flow past sensor, blockages, incorrect wiring, poor insulation or incorrect materials
KU26. the process of installing and connecting external wiring and components safely to avoid electronic interference or mechanical damage
KU27. how to carry out visual checks of the instruments including checking for leaks, security of joints and physical damage
KU28. the relevant replacement parts, materials and other items required for the maintenance process
KU29. the relevant techniques used to dismantle/assemble integrated equipment i.e. release of pressures/force, proof marking to aid reassembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections
KU30. the importance and process of attaching identification marks/labels to removed components or cables, to assist with reassembly
KU31. the applicable methods for checking components are fit for purpose, and the need to replace electronic modules, sensors, transmitters, transducers, electronic boards and other failed items
KU32. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for their intended purpose
KU33. the equipment operating and control procedures to be applied during the maintenance activity
KU34. how to resolve the common problems encountered during the maintenance of the

instrumentation and control system

KU35. how to adopt a systematic Plan-Do-Check-Act (PDCA) approach for solving problems and improving business

KU36. the importance of making process improvements by engaging the relevant stakeholders

KU37. how to create and update the SOPs, maintenance schedules and plans

KU38. the techniques used to communicate information using visual control systems such as card systems, colour coding, floor footprints, graphs and charts, team boards, tool/equipment shadow boards, etc.

KU39. the process of carrying out different types of maintenance such as preventive, corrective, predictive and reactive maintenance, and the activities these entail

KU40. the benefits and methods of resource optimisation

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 get the latest updates about the field of work

GS3. listen attentively to understand the information/ instructions being shared

GS4. communicate politely and professionally

GS5. plan and prioritise tasks to ensure timely completion

GS6. evaluate all possible solutions to a problem to select the best one

GS7. coordinate with the co-workers to achieve the work objectives

GS8. identify possible disruptions to work and take appropriate preventive measures

GS9. take quick decisions to deal with workplace emergencies/ accidents

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0803
NOS Name	Carry out maintenance activities on instrumentation and control equipment
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Calibration and Instrumentation
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	
Next Review Date	
Deactivation Date	
NSQC Clearance Date	

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 the proportion of marks for Theory and Skills Practical for each PC.

3. The assessment for the theory part will/may be based on a knowledge bank of questions approved by CGSC.

4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/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

Total						

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
OEE	Overall Equipment Effectiveness
ESD	Electrostatic Discharge
PDCA	Plan Do Check Act
SOP	Standard Operating Procedure
ERP	Enterprise Resource Planning
AC/ DC	Alternating Current / Direct Current
RLC	Units Of Resistance, Inductance And Capacitance Respectively
CO2	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment

Glossary

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.

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.