

## QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

### What are Occupational Standards(OS) ?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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## Contents

1. Introduction and Contacts.....	1
2. Qualifications Pack.....	2
3. Glossary of Key Terms.....	4
4. OS Units.....	6
5. Annexure: Nomenclature for QP & OS.....	49
6. Assessment Criteria.....	51

## Introduction

### Qualifications Pack- Technician Instrumentation

**SECTOR/S:** CAPITAL GOODS

**SUB-SECTOR:**

- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| 1. Machine Tools                    | 4. Process Plant Machinery        |
| 2. Plastics Manufacturing Machinery | 5. Electrical and Power Machinery |
| 3. Textile Manufacturing Machinery  | 6. Light Engineering Goods        |

**OCCUPATION:** Calibration and Instrumentation

**REFERENCE ID:** CSC/Q0802

**ALIGNED TO:** NCO-2004/7311.67

**Brief Job Description:** It involves dismantling removing and replacing a range of instruments and faulty peripheral components down to unit and component level, setting up test equipment, troubleshooting components of instruments, calibrating them and also preparing service reports and accurately documenting parts replacement and repair.

**Personal Attributes:** Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.

<b>Job Details</b>	<b>Qualifications Pack Code</b>	<b>CSC/Q0802</b>		
	<b>Job Role</b>	<b>Technician Instrumentation</b> [Applicable for National Scenarios]		
	<b>Credits</b>	<b>TBD</b>	<b>Version number</b>	<b>1.0</b>
	<b>Sector</b>	<b>Capital Goods</b>	<b>Drafted on</b>	<b>14/04/2014</b>
	<b>Sub-sector</b>	<ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Plastics Manufacturing Machinery</li> <li>3. Textile Manufacturing Machinery</li> <li>4. Process Plant Machinery</li> <li>5. Electrical and Power Machinery</li> <li>6. Light Engineering Goods</li> </ol>	<b>Last reviewed on</b>	<b>24/11/2017</b>
	<b>Occupation</b>	<b>Calibration and Instrumentation</b>	<b>Next review date</b>	<b>24/11/2021</b>
	<b>NSQC Clearance on</b>	<b>19/05/2015</b>		

Job Role	Technician Instrumentation
Role Description	Perform maintenance activities of measuring and control process equipment and calibrate in accordance with approved procedures.
NSQF level	4
Minimum Educational Qualifications Maximum Educational Qualifications	Diploma(10+) - Mechanical, Electrical, Electronic /Mechatronics Not Applicable
Prerequisite License or Training	No Previous Training Required
Minimum Job Entry Age	18 Years
Experience	Minimum 1 year in manufacturing (Capital Goods)
Applicable National Occupational Standards (NOS)	<p><b>Compulsory:</b></p> <ol style="list-style-type: none"> <li><a href="#">CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment</a></li> <li><a href="#">CSC/N0802 Calibrate electrical and electronic measuring and control equipment</a></li> <li><a href="#">CSC/N0803 Carry out maintenance activities on instrumentation and control equipment</a></li> <li><a href="#">CSC/N1335 Use basic health and safety practices at the workplace</a></li> <li><a href="#">CSC/N1336 Work effectively with others</a></li> </ol>
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
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 they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria 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 OSs, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
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.
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	Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual need 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.

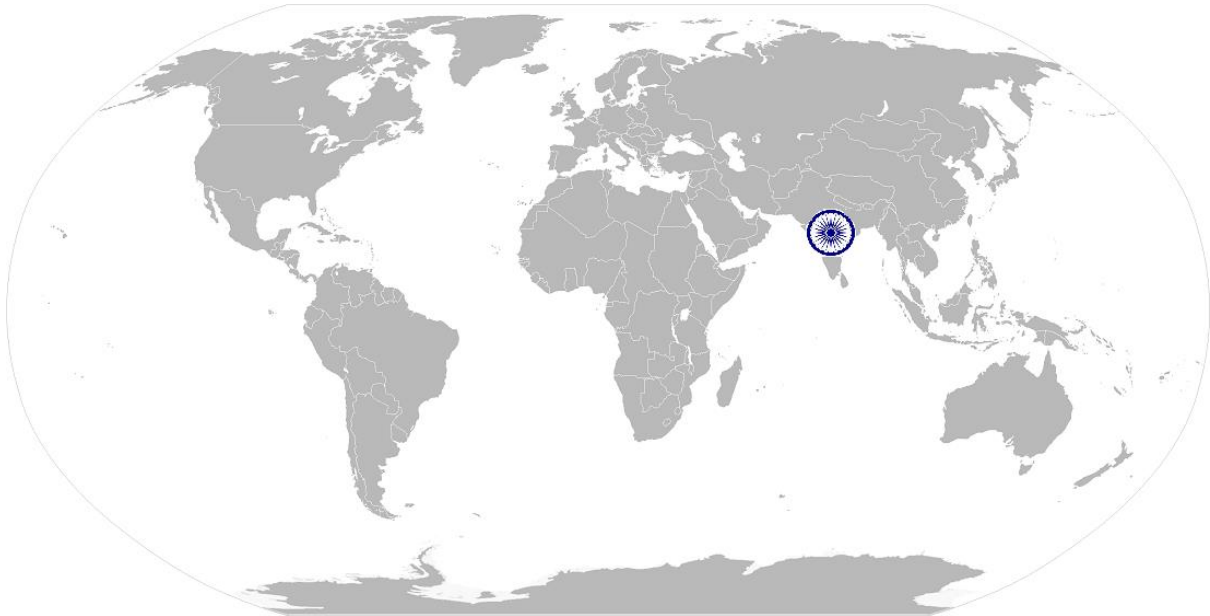
Acronyms

Core Skills/ Generic Skills	Core skills or generic skills 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. In the context of the OS, these include communication related skills that are applicable to most job roles.
Keywords /Terms	Description
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
CO <sub>2</sub>	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment

**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

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# National Occupational Standard



## Overview

This unit covers setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic measuring and control instruments.

## CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment

National Occupational Standard	<b>Unit Code</b>	CSC/N0801
	<b>Unit Title (Task)</b>	Calibrate hydraulic, pneumatic and mechanical measuring and control equipment
	<b>Description</b>	This unit covers setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic, measuring and control instruments using reference standards in accordance with predetermined procedures. The candidate will be expected to work with minimal supervision, taking personal responsibility for own actions and for the quality and accuracy of the work carried out.
	<b>Scope</b>	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> <li>• Work safely</li> <li>• Check equipment for correct operation</li> <li>• Test measure and control equipment</li> <li>• Analyse and reporting test results</li> <li>• Calibrate measuring and control equipment</li> </ul>
<b>Performance Criteria(PC) w.r.t. the Scope</b>		
<b>Element</b>	<b>Performance Criteria</b>	
<b>Work safely</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work</p> <p>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations</p> <p>PC3. work following laid down procedures and instructions</p> <p>PC4. ensure work area is clean and safe from hazards</p> <p>PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition</p>	
<b>Check equipment for correct operation</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults</p>	
<b>Test measure and control equipment</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC7. prepare and update relevant testing/calibration schedules and plans</p> <p>PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale</p> <p>Testing/calibration activities: visual inspection of the instrument for completeness and freedom from damage or foreign objects; standard serviceability test/calibration; special-to-type tests; operational/function checks; gauge repeatability and reliability tests; statistical process control methods</p>	

**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

	<p>PC9. identify work/test requirements and define are per standard operating procedures</p> <p>PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices</p> <p>PC11. select correct test application principles after inspection of instrumentation systems, equipment/components</p> <p>PC12. select appropriate test equipment in accordance with defined requirements</p> <p>PC13. observe device isolation methods/requirements and localize</p> <p>PC14. apply appropriate test procedures and application principles in assessing operation of instrumentation systems, equipment/components</p> <p>PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>PC16. complete relevant testing/calibration documentation accurately</p>
<p><b>Analyse and reporting test results</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC17. analyse and verify test results against operational specifications to identify and localise faults</p> <p>PC18. report potential and real faults using standard operating procedures</p> <p>PC19. evaluate faulty conditions and plan corrective action</p> <p>PC20. record action plan and document according to standard operating procedures</p>
<p><b>Calibrate measuring and control equipment</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures Instrumentation control equipment: for weight (eg. mechanical systems, load cells/strain gauges, transducers); speed measurement equipment; speed control equipment (eg. mechanical governors,); valves and valve mechanisms (eg. control valves, valve actuators and positioners); other specific instrumentation</p> <p>PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures Testing and calibrating tools: pressure gauge; standard test gauges; micrometers; jigs and fixtures; templates and patterns; insulation testers; calibrated weights; vernier caliper; dead weight tester; test gauges, manometers; gyroscope</p> <p>PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration</p> <p>PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications</p> <p>PC25. re-commission equipment in accordance with standard operating procedures</p> <p>PC26. obtain help or advice from specialist if the problem is outside his/her area of</p>



**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

	<p>competence or experience</p> <p>PC27. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem</p> <p>PC28. complete documentation post operations as per organizational procedures Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.</p>
<b>Knowledge and Understanding (K)</b>	
<p><b>A. Organizational Context</b> (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. relevant health and safety requirements applicable in the work place</p> <p>KA3. importance of working in clean and safe environment</p> <p>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA5. reporting structure, inter-dependent functions, lines and procedures in the work area</p> <p>KA6. relevant people and their responsibilities within the work area</p> <p>KA7. escalation matrix and procedures for reporting work and employment related issues</p> <p>KA8. documentation and related procedures applicable in the context of employment and work</p> <p>KA9. importance and purpose of documentation in context of employment and work</p>
<p><b>B. Technical Knowledge</b></p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. knowledge of standards, legislative or regulatory requirements applicable to the measuring equipment and/or its calibration</p> <p>KB2. standard operating procedures for calibrating the measuring equipment and the tools and equipment required to do so</p> <p>KB3. standard operating procedures for commissioning the measuring equipment</p> <p>KB4. calibration records to be kept/maintained in accordance with standard operating procedures</p> <p>KB5. measuring equipment specifications, operation, wearing parts, connections and components</p> <p>KB6. using appropriate tools and equipment to check measuring equipment for faults</p> <p>KB7. using appropriate techniques to check the calibration of the measuring equipment for conformance to specifications</p> <p>KB8. calibrating the measuring equipment against the appropriate physical</p>

## CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment

	<p>standard</p> <p>KB9. re-commissioning the measuring equipment</p> <p>KB10. checks that are to be made of the measuring equipment and the tools and equipment to be used when checking the measuring equipment</p> <p>KB11. common fault(s) that may be found in the measuring equipment</p> <p>KB12. effects of faults on the performance/accuracy of the measuring equipment</p> <p>KB13. hazards and controls associated with calibrating measuring equipment</p> <p>KB14. functionality of the equipment and tolerance levels for calibration</p> <p>KB15. instrumentation principles (eg. controlling density, level, flow, temperature, composition of a range of materials)</p> <p>KB16. principles of hydraulic and pneumatic flow</p> <p>KB17. application principles in assessing operation of instrumentation systems, equipment/components</p> <p>KB18. procedures and equipment for inspecting and testing instrumentation system</p> <p>KB19. calibration procedures of instrumentation systems and equipment/components</p> <p>KB20. purpose/operational function of instrumentation system</p> <p>KB21. specifications of each instrumentation system and acceptable deviations from specifications</p> <p>KB22. procedures for repairing faulty instrumentation system</p> <p>KB23. dismantling, reassembly and testing techniques</p> <p>KB24. correct operation of the instrumentation system including the procedures for isolating instrumentation systems</p> <p>KB25. range of faults in instrumentation system/equipment components</p> <p>KB26. procedures for checking and verifying the operational function of the instrumentation system/equipment</p> <p>KB27. procedures for recording and completing service reports</p> <p>KB28. operational specifications of the instrumentation system/equipment</p> <p>KB29. variations between test results and operational specifications</p> <p>KB30. probable causes of faults in instrumentation system/equipment components</p> <p>KB31. action to be taken to rectify the causes of faults in instrumentation systems/equipment</p> <p>KB32. sequence of events to be undertaken to correct faults in the instrumentation system/equipment components</p> <p>KB33. methods of determining procedures</p> <p>KB34. procedures for reporting faults</p> <p>KB35. difference between real and potential faults</p> <p>KB36. procedures for recording/documenting test and calibration results</p> <p>KB37. function and procedures for zero, span and range checks on instrumentation</p>
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**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

	<p>systems/equipment</p> <p>KB38. equipment required to carry out the calibration of instrumentation systems/equipment</p>
<b>Skills (S)</b>	
<p><b>A. Core Skills/ Generic Skills</b></p>	<p><b>Reading Skills</b></p>
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language</p>
	<p><b>Writing Skills</b></p>
<p>The user/individual on the job needs to know and understand how to:</p> <p>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA3. undertake numerical operations, and calculations/ formulae Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages</p> <p>SA4. identify and draw various basic, compound and solid shapes as per dimensions given Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder</p> <p>SA5. use appropriate measuring techniques and units of measurement</p> <p>SA6. use appropriate units and number systems to express degree of accuracy Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity</p> <p>SA7. interpret and express tolerance in terms of limits on dimensions</p> <p>SA8. calculation of the value of angles in a triangle Angles in a triangle: right-angled, isosceles, equilateral</p> <p>SA9. identify the correct order for performing mathematical operations and solve equations that contain multiple operations</p> <p>SA10. use basic algebra to solve for the unknown</p> <p>SA11. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.</p> <p>SA12. interpret tables and graphs to determine intermediate and extrapolated values</p> <p>SA13. calculate the slope, intercept, and linearity of data sets, and interpret graphs</p>	

**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

	<p>and plots that illustrate these aspects of data</p> <p>SA14. convert various units of measurement between English and metric units, including length, area, volume, capacity, and weight</p> <p>SA15. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole</p> <p>SA16. identify fundamental constants c (velocity or speed of light in a vacuum), g (gravitational constant), and R (universal gas constant), their standard symbols, and their common applications</p>
	<p><b>Oral Communication (Listening and Speaking skills)</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA17. convey and share technical information clearly using appropriate language</p> <p>SA18. check and clarify task-related information</p> <p>SA19. liaise with appropriate authorities using correct protocol</p> <p>SA20. communicate with people in respectful form and manner in line with organizational protocol</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p>
	<p>NA</p>
	<p><b>Plan and Organize</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. plan, prioritize and sequence work operations as per job requirements</p> <p>SB2. organize and analyze information relevant to work</p> <p>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p>
	<p><b>Customer Centricity</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. exercise restraint while expressing dissent and during conflict situations</p> <p>SB5. avoid and manage distractions to be disciplined at work</p> <p>SB6. manage own time for achieving better results</p> <p>SB7. work in a team in order to achieve better results</p> <p>SB8. identify and clarify work roles within a team</p> <p>SB9. communicate and cooperate with others in the team for better results</p> <p>SB10. seek assistance from fellow team members</p>
	<p><b>Problem Solving</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB12. prioritize and plan for problem solving</p>

**CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment**

	<p>SB13. communicate problems appropriately to others</p> <p>SB14. identify sources of information and support for problem solving</p> <p>SB15. seek assistance and support from other sources to solve problems</p> <p>SB16. identify effective resolution techniques</p> <p>SB17. select and apply resolution techniques</p> <p>SB18. seek evidence for problem resolution</p>
	<b>Analytical Thinking</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. undertake and express new ideas and initiatives to others</p> <p>SB20. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB22. enhance one's competencies in new and different situations and contexts to achieve more</p>
	<b>Critical Thinking</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB23. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SB24. clarify task related information with appropriate personnel or technical adviser</p> <p>SB25. seek to improve and modify own work practices</p> <p>SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p>

## CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment

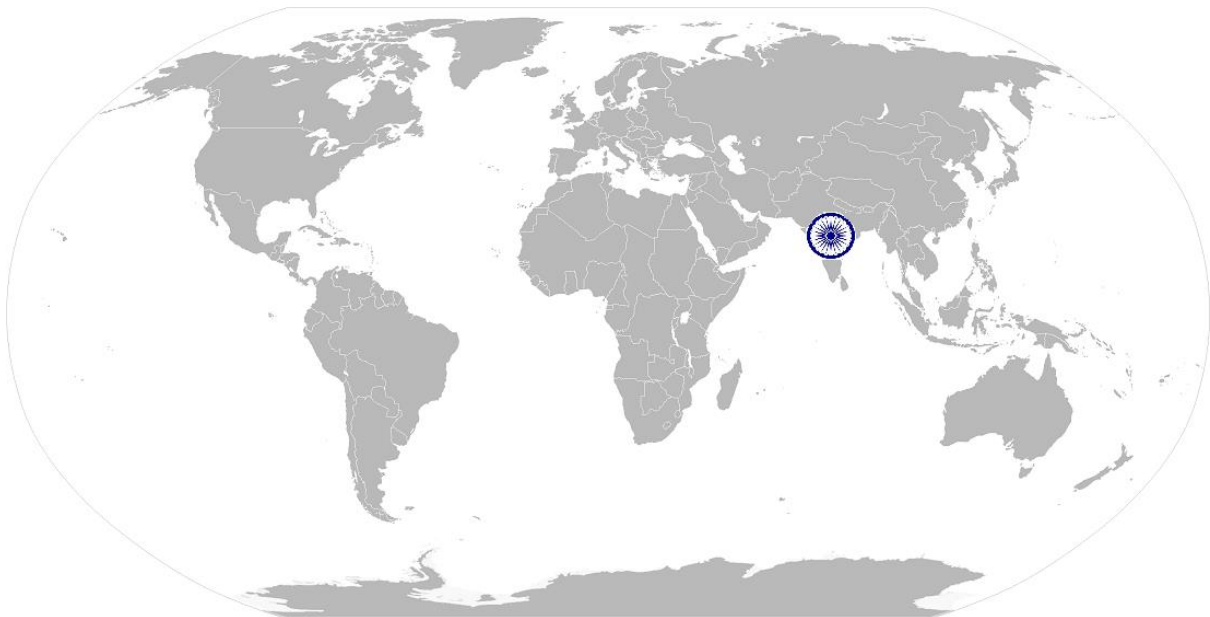
### NOS Version Control

NOS Code	CSC/N0801		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Plastics Manufacturing Machinery</li> <li>3. Textile Manufacturing Machinery</li> <li>4. Process Plant Machinery</li> <li>5. Electrical and Power Machinery</li> <li>6. Light Engineering Goods</li> </ol>	Last reviewed on	24/11/2017
Occupation	Calibration and Instrumentation	Next review date	24/11/2021

**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

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# National Occupational Standard



## Overview

This unit covers testing and calibration of electrical, electronic measuring and control instruments for correct operation in accordance with pre-determined procedures.

## CSC/N0802 Calibrate electrical and electronic measuring and control equipment

National Occupational Standard	<b>Unit Code</b>	CSC/N0802
	<b>Unit Title (Task)</b>	Calibrate electrical and electronic measuring and control equipment
	<b>Description</b>	This unit covers setting, adjustment, validation or verification of electrical, electronic measuring and control instruments using reference standards in accordance with predetermined procedures. The candidate will be expected to work with minimal supervision, taking personal responsibility for own actions, and for the quality and accuracy of the work carried out.
	<b>Scope</b>	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> <li>• Work safely</li> <li>• Check equipment for correct operation</li> <li>• Test measure and control equipment</li> <li>• Analyse and reporting test results</li> <li>• Calibrate measuring and control equipment</li> </ul>
<b>Performance Criteria(PC) w.r.t. the Scope</b>		
<b>Element</b>	<b>Performance Criteria</b>	
<b>Work safely</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work</p> <p>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations</p> <p>PC3. work following laid down procedures and instructions</p> <p>PC4. ensure work area is clean and safe from hazards</p> <p>PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition</p>	
<b>Check equipment for correct operation</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC6. check components, leads, fasteners, etc. for wear, loose connections or other faults</p> <p>Components: sensors, transmitters, converters, indicators, analyzers, controllers, power supplies, removable circuit boards, sensor units associated with determining/controlling density, level, flow, temperature, composition etc. of a range of materials</p>	
<b>Test measure and control equipment</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC7. prepare and update relevant testing/calibration schedules and plans</p> <p>PC8. carry out the testing/calibration activities in the specified sequence and in an agreed timescale</p> <p>Tests and calibrations: visual inspection of the instrument for completeness</p>	



**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

	<p>and freedom from damage or foreign objects; standard serviceability test/calibration; equipment self-diagnostics; leak/pressure test; signal injection tests; soak test; special-to-type tests; signal measurement and transmission; operational/function checks; five-point calibration; unit substitution</p> <p>PC9. identify work/test requirements and define are per standard operating procedures</p> <p>PC10. inspect and test the operation of instruments and systems to diagnose faults using testing devices</p> <p>PC11. select correct test application principles after inspection of instrumentation systems, equipment/components</p> <p>PC12. select appropriate test equipment in accordance with defined requirements</p> <p>PC13. ensure appropriate device isolation methods/requirements are observed</p> <p>PC14. apply appropriate test procedures and application principles in testing the operation of instrumentation systems, equipment/components</p> <p>PC15. report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>PC16. complete relevant testing/calibration documentation accurately</p>
<p><b>Analyse and reporting test results</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC17. analyse and verify test results against operational specifications to identify and localise faults</p> <p>PC18. report potential and real faults using standard operating procedures</p> <p>PC19. evaluate faulty conditions and plan corrective action</p> <p>PC20. record action plan and document according to standard operating procedures</p>
<p><b>Calibrate measuring and control equipment</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC21. assess calibration of measuring and control equipment to manufacturers' specifications and/or standard operating procedures</p> <p>Instrumentation control equipment: for pressure (eg. absolute, gauge, vacuum); for flow (eg. orifice plate, venturi tube, electromagnetic, ultrasonic, differential pressure cell, positive displacement); for level (eg. floats, displacer, differential pressure cells, load cells, ultrasonic, conductivity); for temperature (eg. bi-metallic, thermocouples, resistance, infra-red, thermal imaging); fiscal metering equipment (eg. gas, electricity, water, fuel); detection and alarm equipment (eg. smoke, heat, gas, chemical, water, metal); speed measurement equipment (eg. electrical, stroboscopic); emergency shutdown equipment; speed control equipment (eg. electrical governors, DC speed controller, AC motor control systems, stepper motors, invertors); vibration monitoring equipment (eg. vibration switches, proximity probes, seismic velocity transducer, linear variable differential transformers, portable data collectors); analyzers (eg. gas detection, spectroscopy, oxygen</p>

**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

	<p>analyzer, water analysis, moisture measurement, density); recorders and indicators; telemetry systems (eg. master station, outstation, standalone systems); other specific instrumentation</p> <p>PC22. calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures Testing and calibrating tools: oscilloscopes; pressure gauge; standard test gauges; temperature controllers; temperature baths; current injection devices; voltmeter; insulation testers; pressure sources; analogue and digital meters; digital pressure indicators; logic probes; calibrated flow meters; special purpose test equipment; system calibrators; manometers; pH simulator/buffers; wheatstone bridge; potentiometers; frequency/signalgenerators; logic probes; multimeters, (analog/digital); test gauges; cathode ray oscilloscopes and other associated equipment</p> <p>PC23. undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration</p> <p>PC24. perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications</p> <p>PC25. re-commission equipment in accordance with standard operating procedures</p> <p>PC26. refer the problem to a competent internal/external specialist if it cannot be resolved</p> <p>PC27. obtain help or advice from specialist if the problem is outside his/her area of competence or experience</p> <p>PC28. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem</p> <p>PC29. complete documentation post operations as per organizational procedures Documentation: job card, progress records, incident reports, calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc.</p>
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**Knowledge and Understanding (K)**

<p><b>A. Organizational Context</b> (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. relevant health and safety requirements applicable in the work place</p> <p>KA3. importance of working in clean and safe environment</p> <p>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA5. reporting structure, inter-dependent functions, lines and procedures in the work area</p> <p>KA6. relevant people and their responsibilities within the work area</p>
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**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

	<p>KA7. escalation matrix and procedures for reporting work and employment related issues</p> <p>KA8. documentation and related procedures applicable in the context of employment and work</p> <p>KA9. importance and purpose of documentation in context of employment and work</p>
<p><b>B. Technical Knowledge</b></p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. knowledge of standards, legislative or regulatory requirements applicable to the measuring and control equipment and/or its calibration</p> <p>KB2. standard operating procedures for calibrating the measuring and control equipment and the tools and equipment required to do so</p> <p>KB3. standard operating procedures for commissioning the measuring and control equipment</p> <p>KB4. calibration records to be kept/maintained in accordance with standard operating procedures measuring and control equipment specifications, operation, wearing parts, connections and components Components: sensors, transmitters, converters, indicators, analyzers, controllers, power supplies, removable circuit boards, sensor units associated with determining/controlling density level, flow, temperature, composition etc. of a range of materials</p> <p>KB5. national quality standards, along with a good understanding of electricity and electrical circuitry</p> <p>KB6. using appropriate tools and equipment to check measuring and control equipment for faults</p> <p>KB7. using appropriate techniques to check the calibration of the measuring and control equipment for conformance to specifications</p> <p>KB8. calibrating the measuring and control equipment against the appropriate physical standard</p> <p>KB9. checks that are to be made of the measuring and control equipment and the tools and equipment to be used when checking the measuring and control equipment</p> <p>KB10. common fault(s) that may be found in the measuring and control equipment</p> <p>KB11. effects of faults on the performance/accuracy of the measuring and control equipment</p> <p>KB12. hazards and controls associated with calibrating measuring and control equipment</p> <p>KB13. functionality of the equipment and tolerance levels for calibration</p> <p>KB14. instrumentation principles (eg. controlling density, level, flow, temperature, composition of a range of materials)</p> <p>KB15. effects of resistance, capacitance, inductance and impedance upon electrical</p>

### CSC/N0802 Calibrate electrical and electronic measuring and control equipment

	<p>circuit including RLC series circuit</p> <p>KB16. interpretation requirements of schematic, wiring and block diagrams and circuits</p> <p>KB17. principles of electrical flow</p> <p>KB18. calibration procedures of instrumentation systems and equipment/ components</p> <p>KB19. purpose/operational function of instrumentation system</p> <p>KB20. procedures and equipment for inspecting and testing instrumentation system</p> <p>KB21. specifications of each instrumentation system and acceptable deviations from specifications</p> <p>KB22. procedures for repairing faulty instrumentation system</p> <p>KB23. dismantling, reassembly and testing techniques</p> <p>KB24. correct operation of the instrumentation system including the procedures for isolating instrumentation systems</p> <p>KB25. range of faults in instrumentation system/equipment components</p> <p>KB26. procedures for checking and verifying the operational function of the instrumentation system/equipment</p> <p>KB27. procedures for recording and completing service reports</p> <p>KB28. operational specifications of the instrumentation system/equipment</p> <p>KB29. variations between test results and operational specifications</p> <p>KB30. probable causes of faults in instrumentation system/equipment components</p> <p>KB31. action to be taken to rectify the causes of faults in instrumentation systems/ equipment</p> <p>KB32. sequence of events to be undertaken to correct faults in the instrumentation system/equipment components</p> <p>KB33. errors indicated by built-in devices</p> <p>KB34. methods of determining procedures</p> <p>KB35. procedures for reporting faults</p> <p>KB36. difference between real and potential faults</p> <p>KB37. procedures for recording/documenting test and calibration results</p> <p>KB38. function and procedures for zero, span and range checks on instrumentation systems/equipment</p> <p>KB39. equipment required to carry out the calibration of instrumentation systems/ equipment</p>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Reading Skills</b>
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job</p>

**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

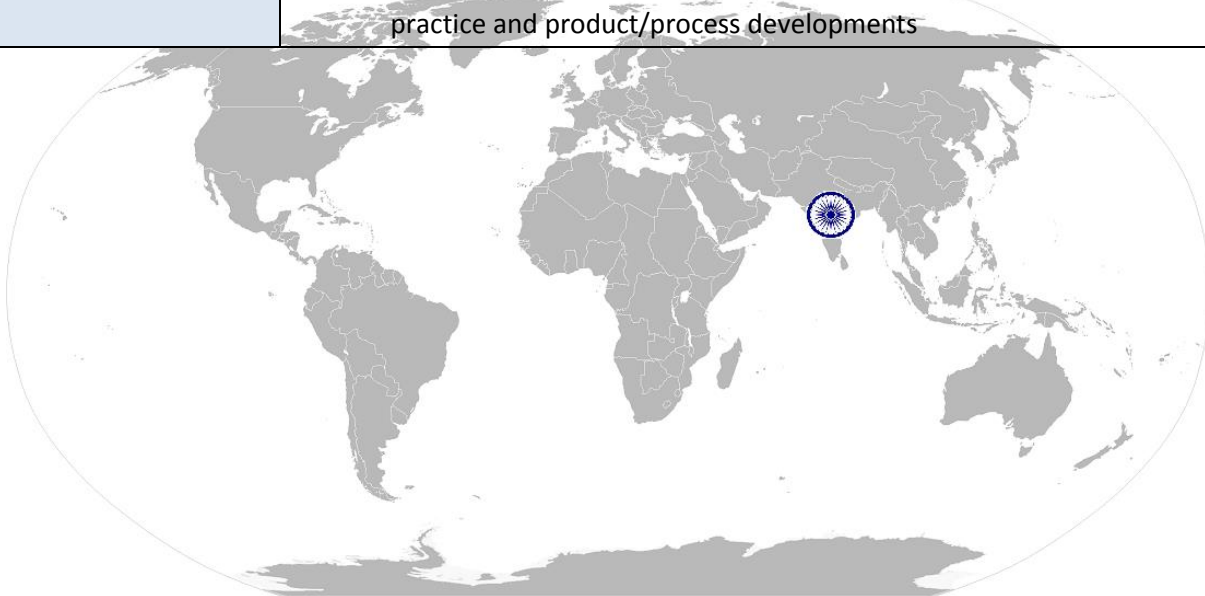
	in English and/or local language
	<b>Writing Skills</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA3. undertake numerical operations, and calculations/ formulae Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages</p> <p>SA4. identify and draw various basic, compound and solid shapes as per dimensions given Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder</p> <p>SA5. use appropriate measuring techniques and units of measurement</p> <p>SA6. use appropriate units and number systems to express degree of accuracy Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity</p> <p>SA7. interpret and express tolerance in terms of limits on dimensions</p> <p>SA8. calculation of the value of angles in a triangle Angles in a triangle: right-angled, isosceles, equilateral</p> <p>SA9. identify the correct order for performing mathematical operations and solve equations that contain multiple operations</p> <p>SA10. use basic algebra to solve for the unknown</p> <p>SA11. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.</p> <p>SA12. interpret tables and graphs to determine intermediate and extrapolated values</p> <p>SA13. calculate the slope, intercept, and linearity of data sets, and interpret graphs and plots that illustrate these aspects of data</p> <p>SA14. convert various units of measurement between English and metric units, including length, area, volume, capacity and weight</p> <p>SA15. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole</p> <p>SA16. identify fundamental constants <math>c</math> (velocity or speed of light in a vacuum), <math>g</math> (gravitational constant), and <math>R</math> (universal gas constant), their standard symbols, and their common applications</p>
	<b>Oral Communication (Listening and Speaking skills)</b>

**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA17. convey and share technical information clearly using appropriate language</p> <p>SA18. check and clarify task-related information</p> <p>SA19. liaise with appropriate authorities using correct protocol</p> <p>SA20. communicate with people in respectful form and manner in line with organizational protocol</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p>
	<p>NA</p>
	<p><b>Plan and Organize</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. plan, prioritize and sequence work operations as per job requirements</p> <p>SB2. organize and analyze information relevant to work</p> <p>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p>
	<p><b>Customer Centricity</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. exercise restraint while expressing dissent and during conflict situations</p> <p>SB5. avoid and manage distractions to be disciplined at work</p> <p>SB6. manage own time for achieving better results</p> <p>SB7. work in a team in order to achieve better results</p> <p>SB8. identify and clarify work roles within a team</p> <p>SB9. communicate and cooperate with others in the team for better results</p> <p>SB10. seek assistance from fellow team members</p>
	<p><b>Problem Solving</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB12. prioritize and plan for problem solving</p> <p>SB13. communicate problems appropriately to others</p> <p>SB14. identify sources of information and support for problem solving</p> <p>SB15. seek assistance and support from other sources to solve problems</p> <p>SB16. identify effective resolution techniques</p> <p>SB17. select and apply resolution techniques</p> <p>SB18. seek evidence for problem resolution</p>
	<p><b>Analytical Thinking</b></p>
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. undertake and express new ideas and initiatives to others</p> <p>SB20. modify work plan to overcome unforeseen difficulties or developments that</p>	

**CSC/N0802 Calibrate electrical and electronic measuring and control equipment**

	<p>occur as work progresses</p> <p>SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB22. enhance one’s competencies in new and different situations and contexts to achieve more</p>
	<p><b>Critical Thinking</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB23. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SB24. clarify task related information with appropriate personnel or technical adviser</p> <p>SB25. seek to improve and modify own work practices</p> <p>SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p>



## CSC/N0802 Calibrate electrical and electronic measuring and control equipment

### NOS Version Control

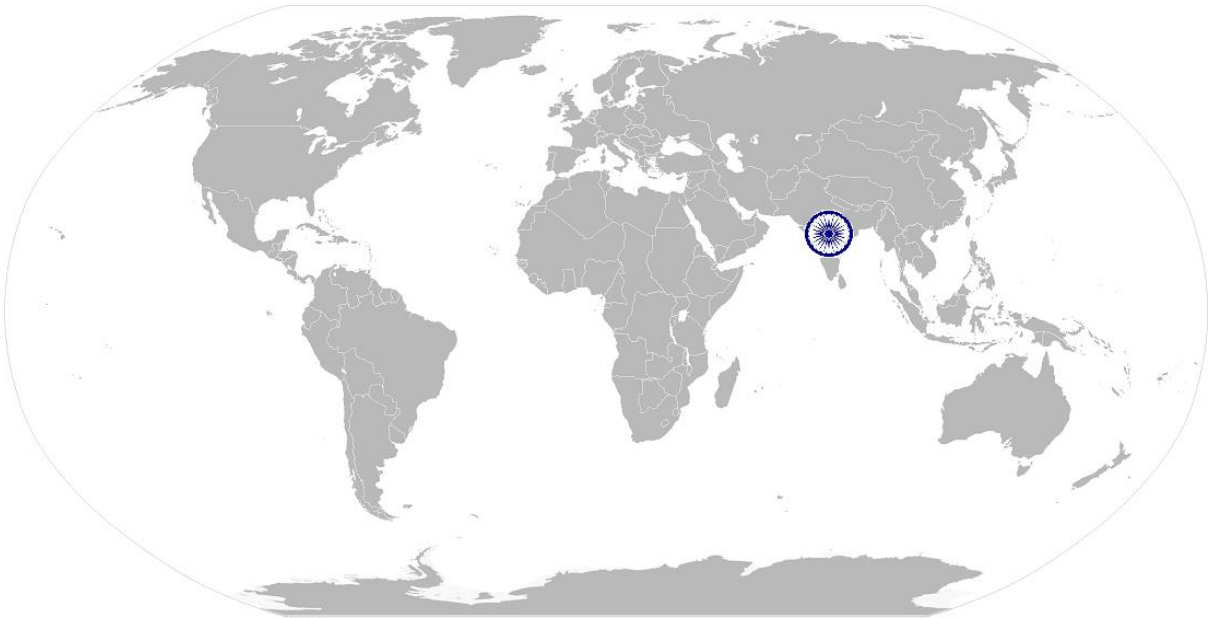
NOS Code	CSC/N0802		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Plastics Manufacturing Machinery</li> <li>3. Textile Manufacturing Machinery</li> <li>4. Process Plant Machinery</li> <li>5. Electrical and Power Machinery</li> <li>6. Light Engineering Goods</li> </ol>	Last reviewed on	24/11/2017
Occupation	Calibration and Instrumentation	Next review date	24/11/2021



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

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# National Occupational Standard



## Overview

This unit covers maintenance activities of measuring and control process equipment, in accordance with approved procedures.

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

National Occupational Standard	<b>Unit Code</b>	<b>CSC/N0803</b>
	<b>Unit Title (Task)</b>	<b>Carry out maintenance activities on instrumentation and control equipment</b>
	<b>Description</b>	This unit covers maintenance activities on instrumentation and control equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing a range of instruments and faulty peripheral components down to unit and component level, as appropriate.
	<b>Scope</b>	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> <li>• Work safely</li> <li>• Perform maintenance activities</li> <li>• Escalations of unresolved problems as per protocol</li> <li>• Interim Feedback to superior, in case of delay</li> <li>• Process Compliances</li> </ul>
<b>Performance Criteria(PC) w.r.t. the Scope</b>		
<b>Element</b>	<b>Performance Criteria</b>	
<b>Work safely</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work</p> <p>PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing instrumentation operations</p> <p>PC3. ensure work area is clean and safe from hazards</p> <p>PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition</p>	
<b>Perform maintenance activities</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC5. obtain and use the correct version of company and/or manufacturer's drawings and maintenance documentation</p> <p>PC6. produce and update relevant maintenance schedules and plans</p> <p>PC7. carry out the maintenance activities by appropriate techniques &amp; procedures on a range of instrumentation and control equipment</p> <p>Maintenance procedures: e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); predictive maintenance (analysis of the equipment's condition); reactive maintenance (unexpected equipment/component failure); maintenance prevention (equipment/component design and development); equipment performance; equipment downtime/failure; overall equipment effectiveness (OEE);</p>	

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

	<p>maintenance costs; health and safety; staff development and training; maintenance procedures/instructions; operator manuals/working instructions; regulatory compliance; etc.</p> <p>Equipment: eg. pressure, flow, level and temperature instruments); fiscal monitoring equipment; smoke, heat, gas, water, chemical and metal detection and alarm systems; industrial weighing systems; linear and rotational speed measurement and control; vibration monitoring equipment; photo-optic instruments; analyzers recorders and indicators; telemetry systems; emergency shutdown systems and other specific instrumentation equipment</p> <p>PC8. re-connect and return the system to service on completion of activities</p> <p>PC9. conduct maintenance activities within the limits of their personal authority</p> <p>PC10. carry out the maintenance activities in the specified sequence and in an agreed timescale</p> <p>PC11. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule</p> <p>PC12. complete relevant maintenance documentation accurately Documentation: job cards; permit to work/formal risk assessment and/or sign-on/off procedures; maintenance log or report; company-specific recording system</p> <p>PC13. dispose of waste materials in accordance with safe working practices and approved procedures</p> <p>PC14. identify and lead on making improvements to maintenance processes and procedures</p>
<p><b>Escalations of unresolved problems as per protocol</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC15. refer the problem to a competent internal/external specialist if it cannot be resolved</p> <p>PC16. obtain help or advice from specialist if the problem is outside candidate's area of competence or experience</p>
<p><b>Interim Feedback to superior, in case of delay</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC17. monitor the problem and keep the superior informed about progress or any delays in resolving the problem</p>
<p><b>Process Compliances</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC18. comply with relevant legislation, standards, policies and procedures</p>
<p><b>Knowledge and Understanding (K)</b></p>	
<p><b>A. Organizational Context</b> (Knowledge of the company /</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. relevant health and safety requirements applicable in the work place</p>

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

<p>organization and its processes)</p>	<p>KA3. importance of working in clean and safe environment</p> <p>KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA5. reporting structure, inter-dependent functions, lines and procedures in the work area</p> <p>KA6. relevant people and their responsibilities within the work area</p> <p>KA7. escalation matrix and procedures for reporting work and employment related issues</p> <p>KA8. documentation and related procedures applicable in the context of employment and work</p> <p>KA9. importance and purpose of documentation in context of employment and work</p>
<p><b>B. Technical Knowledge</b></p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. isolation and lock-off procedures or permit-to-work procedure that applies</p> <p>KB2. health and safety precautions to be applied during the maintenance procedure, and their effects on others</p> <p>KB3. hazards associated with carrying out mechanical maintenance activities (eg. handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks</p> <p>KB4. importance of wearing protective clothing and other appropriate safety equipment during maintenance process</p> <p>KB5. how to obtain and interpret drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process</p> <p>KB6. functioning of different process plant and its measuring and control equipment</p> <p>KB7. procedure to be adopted to establish the background of the fault</p> <p>KB8. how to evaluate the various types of information available for fault diagnosis Sources of evidence of fault diagnostic: person or operator who reported the fault; equipment self-diagnosis; test instrument measurements (eg. multimeter, oscilloscope, logic probe, signal tracer, signal generator); recording devices; plant/equipment records; circuit outputs/computer display (eg. pressure, flow, temperature); equipment outputs; sensory input (sight, sound, smell, touch)</p> <p>KB9. how to use the various aids and reports available for fault diagnosis Diagnostic aids: logic diagrams; fault analysis charts (eg. fault trees); flow charts or algorithms; manufacturers' manuals; probability charts/reports; troubleshooting guides; computer-aided test equipment; electronic aids</p> <p>KB10. how to use various types of fault diagnostic equipment needed to investigate</p>

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

	<p>the problem</p> <p>Types of fault diagnostic equipment: oscilloscopes; pressure gauge; temperature controllers; micrometer; vernier caliper; voltmeter; all types of comparators; jigs and fixtures; templates and patterns; insulation testers; temperature baths; standard test gauges; calibrated weights; current injection devices; pressure sources; analogue and digital meters; digital pressure indicators; dead weight tester; logic probes; calibrated flow meters; special purpose test equipment; system calibrators; manometers; pH simulator/buffers; wheatstone bridge; potentiometers; frequency/signal generators; logic probes; multimeters (analog/digital); test gauges; cathode ray oscilloscopes and other associated equipment; other specific equipment</p> <p>KB11. various fault finding techniques that can be used and how they are applied Range of fault diagnostic techniques: e.g. half-split technique; input/output technique; injection and sampling; six point technique; emergent sequence; unit substitution; function/performance testing; equipment self-diagnostics; etc.</p> <p>KB12. how to evaluate sensory conditions (by sight, sound, smell, touch)</p> <p>KB13. how to analyze evidence and evaluate possible characteristics and causes of specific faults/problems</p> <p>KB14. how to relate previous reports/records of similar fault conditions</p> <p>KB15. 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</p> <p>KB16. care, handling and application of instrumentation test instruments</p> <p>KB17. how to check that test instruments are within current calibration dates, and that they are free from damage and defects</p> <p>KB18. precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components</p> <p>KB19. basic principles of operation of the instrumentation and control equipment being maintained, how the system functions, its operating sequence, the working purpose of individual units/components and how they interact Control equipment maintenance activities: pressure (eg. absolute, gauge, vacuum); flow (eg. orifice plate, venturi tube, electromagnetic, ultrasonic, differential pressure cell, positive displacement); level (eg. floats, displacer, differential pressure cells, load cells, ultrasonic, conductivity); temperature (eg. bi-metallic, thermocouples, resistance, infra-red, thermal imaging); weight (eg. mechanical systems, load cells/strain gauges, transducers); fiscal metering (eg. gas, electricity, water, fuel); detection and alarm (eg. smoke, heat, gas, chemical, water, metal); speed measurement (eg. mechanical,</p>
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## CSC/N0803 Carry out maintenance activities on instrumentation and control equipment

	<p>electrical, stroboscopic); emergency shutdown; speed control (eg. mechanical governors, electrical governors, DC speed controller, AC motor control systems, stepper motors, invertors); vibration monitoring (eg. vibration switches, proximity probes, seismic velocity transducer, linear variable differential transformers, portable data collectors); analyzers (eg. gas detection, spectroscopy, oxygen analyzer, water analysis, moisture measurement, density); recorders and indicators; telemetry systems (eg. master station, outstation, standalone systems); valves and valve mechanisms (eg. control valves, valve actuators and positioners); other specific instrumentation</p> <p>KB20. reasons for making sure that 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</p> <p>KB21. identification and selection of instrument sensors (including how to identify their markings, calibration information, component values, operating parameters and working range)</p> <p>KB22. correct way of fitting instruments to avoid faulty readings (caused by head correction, poor flow past sensor, blockages, incorrect wiring, poor insulation or incorrect materials)</p> <p>KB23. correct and tidy installation and connection of external wiring and components, to avoid electronic interference or mechanical damage</p> <p>KB24. how to carry out visual checks of the instruments (eg. checking for leaks, security of joints and physical damage)</p> <p>KB25. procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process</p> <p>KB26. techniques used to dismantle/assemble integrated equipment (eg. release of pressures/force, proof marking to aid reassembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)</p> <p>KB27. methods of attaching identification marks/labels to removed components or cables, to assist with reassembly</p> <p>KB28. methods of checking that components are fit for purpose, and the need to replace electronic modules, sensors, transmitters, transducers, electronic boards and other failed items</p> <p>KB29. 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</p> <p>KB30. equipment operating and control procedures to be applied during the maintenance activity</p>
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## CSC/N0803 Carry out maintenance activities on instrumentation and control equipment

	<p>KB31. problems that can occur during the maintenance of the instrumentation and control system, and how they can be overcome</p> <p>KB32. how to conduct a systematic plan, do, check, act (PDCA) approach to problem-solving and business improvement</p> <p>KB33. how to evaluate improvement ideas in order to select those that are to be pursued</p> <p>KB34. improvements to the process are achieved by engaging the knowledge and experience of the people working on the process</p> <p>KB35. how to create or update Standard Operating Procedures (SOP's) maintenance schedules and plans</p> <p>KB36. the techniques required to communicate information using visual control systems (eg. card systems, color coding, floor footprints, graphs and charts, team boards, tool/equipment shadow boards)</p>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Reading Skills</b>
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language</p>
	<b>Writing Skills</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA3. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals)</p> <p>SA4. identify and draw various basic, compound and solid shapes as per dimensions given Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder</p> <p>SA5. use appropriate measuring techniques and units of measurement use appropriate units and number systems to express degree of accuracy Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity</p> <p>SA6. interpret and express tolerance in terms of limits on dimensions</p> <p>SA7. calculation of the value of angles in a triangle</p>

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

	<p>Angles in a triangle: right-angled, isosceles, equilateral</p> <p>SA8. identify the correct order for performing mathematical operations and solve equations that contain multiple operations</p> <p>SA9. use basic algebra to solve for the unknown</p> <p>SA10. convert between various angular units such as degrees, minutes, seconds, grads, radians, etc.</p> <p>SA11. interpret tables and graphs to determine intermediate and extrapolated values</p> <p>SA12. calculate the slope, intercept, and linearity of data sets, and interpret graphs and plots that illustrate these aspects of data</p> <p>SA13. convert various units of measurement between English and metric units, including length, area, volume, capacity, and weight</p> <p>SA14. describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole</p> <p>SA15. identify fundamental constants <math>c</math> (velocity or speed of light in a vacuum), <math>g</math> (gravitational constant), and <math>R</math> (universal gas constant), their standard symbols, and their common applications</p>
	<p><b>Oral Communication (Listening and Speaking skills)</b></p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA16. convey and share technical information clearly using appropriate language</p> <p>SA17. check and clarify task-related information</p> <p>SA18. liaise with appropriate authorities using correct protocol</p> <p>SA19. communicate with people in respectful form and manner in line with organizational protocol</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p> <p>NA</p> <p><b>Plan and Organize</b></p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. plan, prioritize and sequence work operations as per job requirements</p> <p>SB2. organize and analyze information relevant to work</p> <p>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p> <p><b>Customer Centricity</b></p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. importance of taking responsibility for own work outcomes</p> <p>SB5. importance of adherence to work timings, dress code and other organizational policies</p> <p>SB6. importance of following laid down rules, procedures, instructions and policies</p>

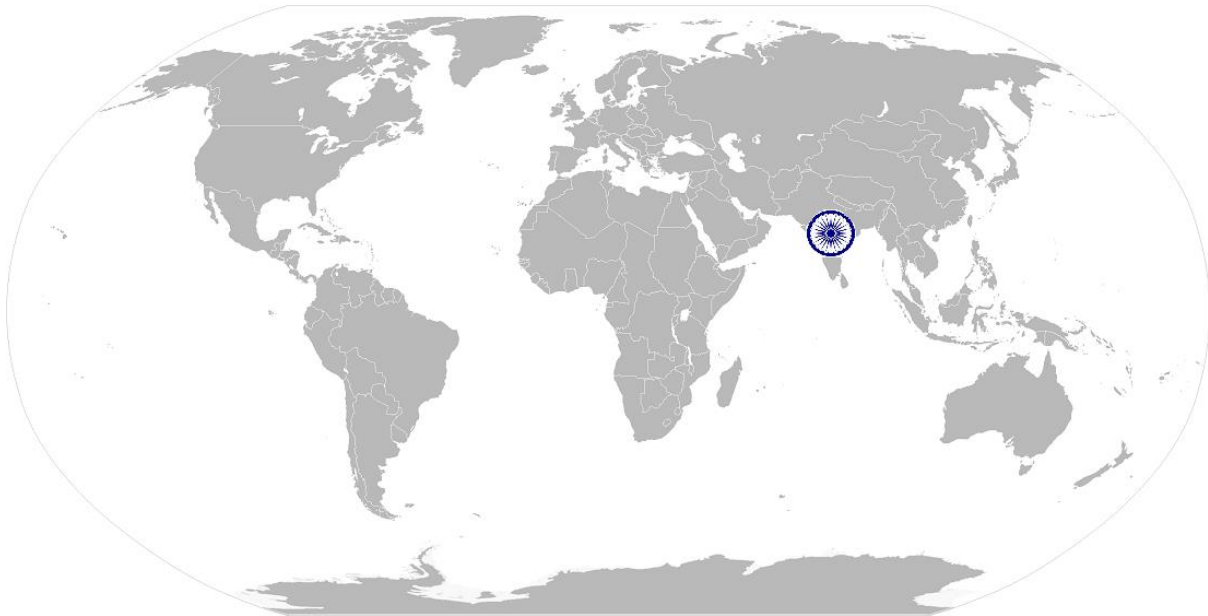


## CSC/N0803 Carry out maintenance activities on instrumentation and control equipment

	<p>SB7. importance of exercising restraint while expressing dissent and during conflict situations</p> <p>SB8. how to avoid and manage distractions to be disciplined at work</p> <p>SB9. importance of time management for achieving better results work in a team in order to achieve better results</p> <p>SB10. work in a team in order to achieve better results</p> <p>SB11. identify and clarify work roles within a team</p> <p>SB12. communicate and cooperate with others in the team for better results</p> <p>SB13. seek assistance from fellow team members</p>
	<b>Problem Solving</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB14. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB15. prioritize and plan for problem solving</p> <p>SB16. communicate problems appropriately to others</p> <p>SB17. identify sources of information and support for problem solving</p> <p>SB18. seek assistance and support from other sources to solve problems</p> <p>SB19. identify effective resolution techniques</p> <p>SB20. select and apply resolution techniques</p> <p>SB21. seek evidence for problem resolution</p>
	<b>Analytical Thinking</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB22. importance and impact of initiative and enterprise for achieving better results for self, others and organization</p> <p>SB23. how to undertake and express new ideas and initiatives to others</p> <p>SB24. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB25. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB26. enhance one's competencies can and should be applied in new and different situations and contexts to achieve more</p>
	<b>Critical Thinking</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB27. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SB28. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments</p> <p>SB29. participate in on-the-job and other learning, training and development</p>

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

	<p>interventions and assessment</p> <p>SB30. clarify task related information with appropriate personnel or technical adviser</p> <p>SB31. seek to improve and modify own work practices</p>
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**CSC/N0803 Carry out maintenance activities on instrumentation and control equipment**

**NOS Version Control**

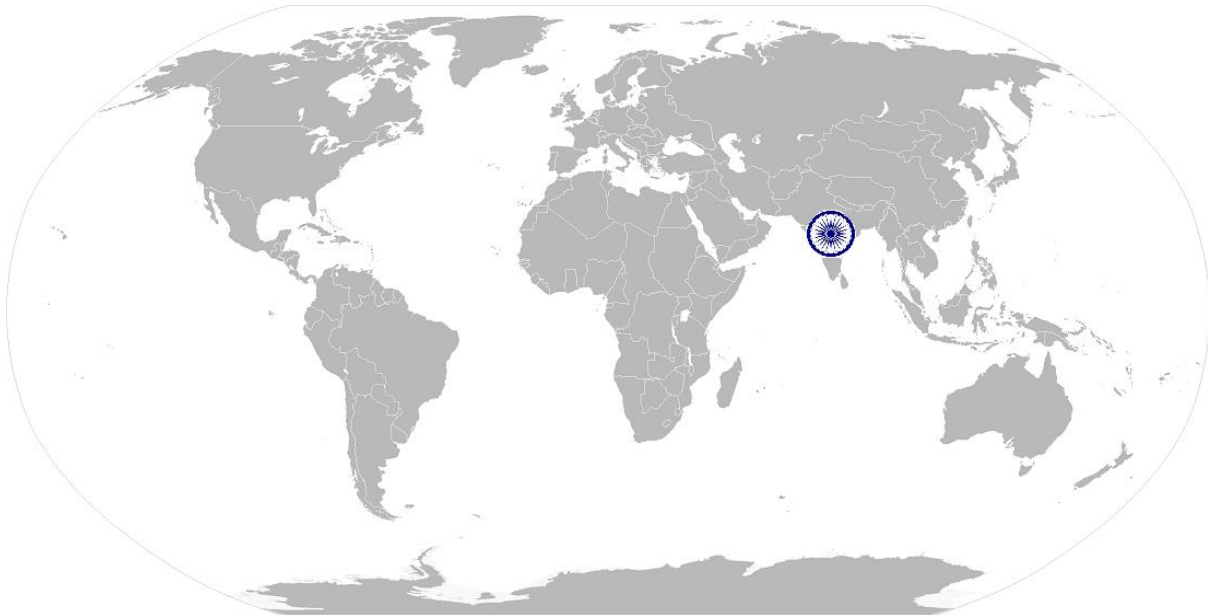
NOS Code	CSC/N0803		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	1. Machine Tools 2. Plastics Manufacturing Machinery 3. Textile Manufacturing Machinery 4. Process Plant Machinery 5. Electrical and Power Machinery 6. Light Engineering Goods	Last reviewed on	24/11/2017
Occupation	Calibration and Instrumentation	Next review date	24/11/2021

CSC/N1335

Use basic health and safety practices at the workplace

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# National Occupational Standard



## Overview

This unit covers health, safety and security at the workplace. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment.

**CSC/N1335 Use basic health and safety practices at the workplace**

<b>National Occupational Standard</b>	<b>Unit Code</b>	<b>CSC/N1335</b>
	<b>Unit Title (Task)</b>	<b>Use basic health and safety practices at the workplace</b>
	<b>Description</b>	This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment.
	<b>Scope</b>	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> <li>• Health and safety</li> <li>• Fire safety</li> <li>• Emergencies, rescue and first-aid procedure</li> </ul>
	<b>Performance Criteria(PC) w.r.t. the Scope</b>	
<b>Element</b>	<b>Performance Criteria</b>	
<b>Health and safety</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. use protective clothing/equipment for specific tasks and work conditions Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator</p> <p>PC2. state the name and location of people responsible for health and safety in the workplace</p> <p>PC3. state the names and location of documents that refer to health and safety in the workplace</p> <p>PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace</p> <p>Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.)</p> <p>Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious</p>	

**CSC/N1335 Use basic health and safety practices at the workplace**

	<p>illness)</p> <p>PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc.</p> <p>PC6. state methods of accident prevention in the work environment of the job role Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors</p> <p>PC7. state location of general health and safety equipment in the workplace General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans)</p> <p>PC8. inspect for faults, set up and safely use steps and ladders in general use Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc. Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.</p> <p>PC9. work safely in and around trenches, elevated places and confined areas</p> <p>PC10. lift heavy objects safely using correct procedures</p> <p>PC11. apply good housekeeping practices at all times Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces</p> <p>PC12. identify common hazard signs displayed in various areas Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.</p> <p>PC13. retrieve and/or point out documents that refer to health and safety in the workplace Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg</p>
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**CSC/N1335 Use basic health and safety practices at the workplace**

<p><b>Fire safety</b></p>	<p>government notices)</p> <p>To be competent, the user/individual on the job must be able to:</p> <p>PC14. use the various appropriate fire extinguishers on different types of fires correctly</p> <p>Types of fires: Class A: eg. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: eg. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents)</p> <p>PC15. demonstrate rescue techniques applied during fire hazard</p> <p>PC16. demonstrate good housekeeping in order to prevent fire hazards</p> <p>PC17. demonstrate the correct use of a fire extinguisher</p>
<p><b>Emergencies, rescue and first-aid procedures</b></p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC18. demonstrate how to free a person from electrocution</p> <p>PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.</p> <p>PC20. demonstrate basic techniques of bandaging</p> <p>PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments</p> <p>PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments</p> <p>PC23. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases</p> <p>PC24. demonstrate the artificial respiration and the CPR Process</p> <p>PC25. participate in emergency procedures</p> <p>Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work</p> <p>PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible</p> <p>Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified</p> <p>PC27. demonstrate correct method to move injured people and others during an emergency</p>
<p><b>Knowledge and Understanding (K)</b></p>	

**CSC/N1335 Use basic health and safety practices at the workplace**

<p><b>A. Organizational Context</b> (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace</p> <p>KA2. names and location of documents that refer to health and safety in the workplace</p>
<p><b>B. Technical Knowledge</b></p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. meaning of “hazards” and “risks”</p> <p>KB2. health and safety hazards commonly present in the work environment and related precautions</p> <p>KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible</p> <p>KB4. possible causes of risk and accident</p> <p>Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness)</p> <p>KB5. methods of accident prevention Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors</p> <p>KB6. safe working practices when working with tools and machines</p> <p>KB7. safe working practices while working at various hazardous sites</p> <p>KB8. where to find all the general health and safety equipment in the workplace</p> <p>KB9. various dangers associated with the use of electrical equipment</p> <p>KB10. preventative and remedial actions to be taken in the case of exposure to toxic materials</p> <p>Exposure: ingested, contact with skin, inhaled Preventative action: ventilation, masks, protective clothing/ equipment); Remedial action: immediate first aid, report to supervisor Toxic materials: solvents, flux, lead</p> <p>KB11. importance of using protective clothing/equipment while working</p> <p>KB12. precautionary activities to prevent the fire accident</p> <p>KB13. various causes of fire Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.</p> <p>KB14. techniques of using the different fire extinguishers</p> <p>KB15. different methods of extinguishing fire</p> <p>KB16. different materials used for extinguishing fire</p>



**CSC/N1335 Use basic health and safety practices at the workplace**

	<p>Materials: sand, water, foam, CO<sub>2</sub>, dry powder</p> <p>KB17. rescue techniques applied during a fire hazard</p> <p>KB18. various types of safety signs and what they mean</p> <p>KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries</p> <p>KB20. content of written accident report</p> <p>KB21. potential injuries and ill health associated with incorrect manual handling</p> <p>KB22. safe lifting and carrying practices</p> <p>KB23. personal safety, health and dignity issues relating to the movement of a person by others</p> <p>KB24. potential impact to a person who is moved incorrectly</p>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Reading Skills</b>
	The user/ individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SA1. read and comprehend basic content to read labels, charts, signages</li> <li>SA2. read and comprehend basic English to read manuals of operations</li> <li>SA3. read an accident/incident report in local language or English</li> </ul>
	<b>Writing Skills</b>
	The user/individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SA4. write an accident/incident report in local language or English</li> </ul>
	<b>Oral Communication (Listening and Speaking skills)</b>
	The user/individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SA5. question coworkers appropriately in order to clarify instructions and other issues</li> <li>SA6. give clear instructions to coworkers, subordinates others</li> </ul>
<b>B. Professional Skills</b>	<b>Decision Making</b>
	The user/individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SB1. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines</li> </ul>
	<b>Plan and Organize</b>
	The user/individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SB2. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity</li> </ul>
	<b>Customer Centricity</b>
The user/individual on the job needs to know and understand how to: <ul style="list-style-type: none"> <li>SB3. remain congenial while discussing and debating issues with co-workers</li> </ul>	

**CSC/N1335 Use basic health and safety practices at the workplace**

	<p>SB4. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice</p> <p>SB5. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives</p> <p>SB6. thank coworkers for any assistance received</p> <p>SB7. offer appropriate respect based on mutuality and respect for fellow workmanship and authority</p>
	<b>Problem Solving</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB8. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p> <p>SB9. identify immediate or temporary solutions to resolve delays</p> <p>SB10. identify sources of support that can be availed of for problem solving for various kind of problems</p> <p>SB11. seek appropriate assistance from other sources to resolve problems</p> <p>SB12. report problems that you cannot resolve to appropriate authority</p>
	<b>Analytical Thinking</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB13. identify cause and effect relations in their area of work</p> <p>SB14. use cause and effect relations to anticipate potential problems and their solution</p>
	<b>Critical Thinking</b>
	NA

**CSC/N1335      Use basic health and safety practices at the workplace**

**NOS Version Control**

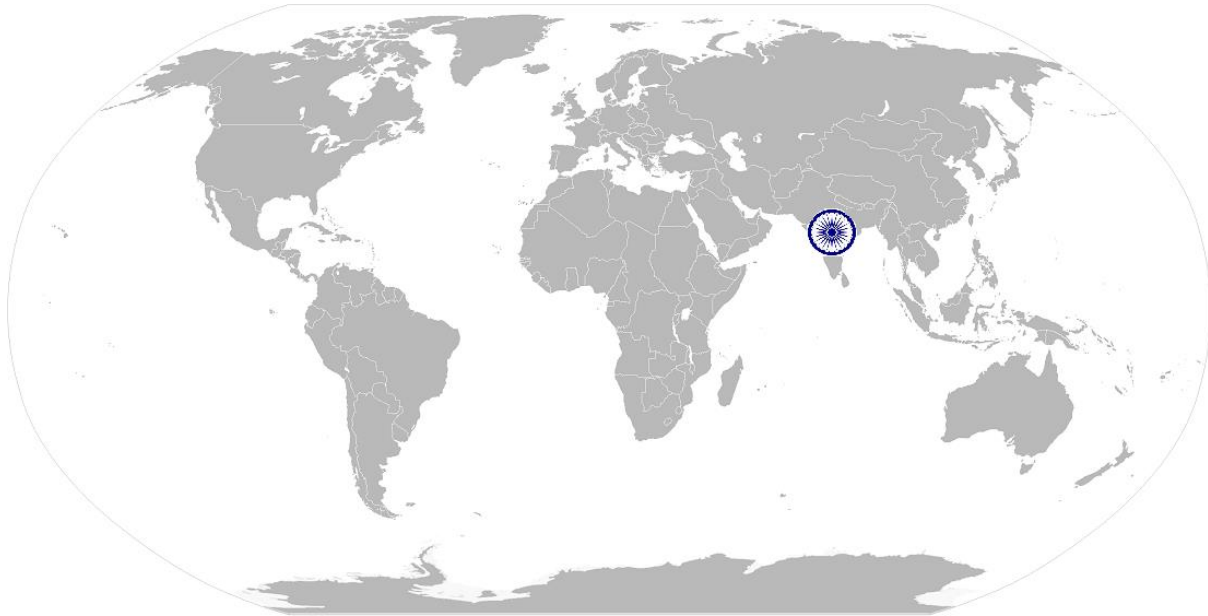
NOS Code	CSC/N1335		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Plastics Manufacturing Machinery</li> <li>3. Textile Manufacturing Machinery</li> <li>4. Process Plant Machinery</li> <li>5. Electrical and Power Machinery</li> <li>6. Light Engineering Goods</li> </ol>	Last reviewed on	24/11/2017
Occupation	Calibration and Instrumentation	Next review date	24/11/2021

CSC/N1336

Work effectively with others

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# National Occupational Standard



## Overview

This unit covers basic practices that improve effectiveness of working with others in an organizational set-up.

CSC/N1336

Work effectively with others

National Occupational Standard

<b>Unit Code</b>	<b>CSC/N1336</b>
<b>Unit Title (Task)</b>	<b>Work effectively with others</b>
<b>Description</b>	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening etc.
<b>Scope</b>	This unit/task covers the following: <ul style="list-style-type: none"> <li>• Work effectively with others</li> </ul>
<b>Performance Criteria(PC) w.r.t. the Scope</b>	
<b>Element</b>	<b>Performance Criteria</b>
<b>Work effectively with others</b>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required</p> <p>PC2. pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt</p> <p>PC3. give information to others clearly, at a pace and in a manner that helps them to understand</p> <p>PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible</p> <p>PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks</p> <p>PC6. display appropriate communication etiquette while working Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc.</p> <p>PC7. display active listening skills while interacting with others at work</p> <p>PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism</p> <p>PC9. demonstrate responsible and disciplined behaviors at the workplace Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.</p> <p>PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict</p>
<b>Knowledge and Understanding (K)</b>	
<b>A. Organizational Context</b> (Knowledge of the company / organization and	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. reporting structure, inter-dependent functions, lines and procedures in the work area</p>

**CSC/N1336**

**Work effectively with others**

its processes)	<p>KA3. relevant people and their responsibilities within the work area</p> <p>KA4. escalation matrix and procedures for reporting work and employment related issues</p>
<b>B. Technical Knowledge</b>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. various categories of people that one is required to communicate and co-ordinate with in the organization</p> <p>KB2. importance of effective communication in the workplace</p> <p>KB3. importance of teamwork in organizational and individual success</p> <p>KB4. various components of effective communication</p> <p>KB5. key elements of active listening</p> <p>KB6. value and importance of active listening and assertive communication</p> <p>KB7. barriers to effective communication</p> <p>KB8. importance of tone and pitch in effective communication</p> <p>KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles</p> <p>KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer</p> <p>KB11. importance of ethics for professional success</p> <p>KB12. importance of discipline for professional success</p> <p>KB13. what constitutes disciplined behavior for a working professional</p> <p>KB14. common reasons for interpersonal conflict</p> <p>KB15. importance of developing effective working relationships for professional success</p> <p>KB16. expressing and addressing grievances appropriately and effectively</p> <p>KB17. importance and ways of managing interpersonal conflict effectively</p>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<p><b>Reading Skills</b></p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. read basic terms and terminologies to accurately interpret work related documents, labels, supervisor instructions in the local language</p> <p>SA2. read and interpret accurate information from various relevant work instructions and records</p> <p><b>Writing Skills</b></p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA3. write clear and legible notes to self, colleagues and seniors to pass messages, keep records, prepare to-do lists, take down instructions</p> <p>SA4. write basic numbers, quantities and work related terminology for operational requirements in the local language</p> <p><b>Oral Communication (Listening and Speaking skills)</b></p>

**CSC/N1336**

**Work effectively with others**

	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA5. interact with the supervisor appropriately (correct protocol and manner of speaking) in order to understand the basic requirements of the product, production plans and other associated requirements</p> <p>SA6. give clear instructions to co-workers about the type of output required and answer queries</p> <p>SA7. display active listening skills while interacting with co-workers and other in the workplace</p>
<b>B. Professional Skills</b>	<b>Decision Making</b>
	NA
	<b>Plan and Organize</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. use appropriate planning to maintain a smooth relationship with fellow team members</p> <p>SB2. take steps within one's limits of authority to initiate modification in plan if the circumstances require it</p>
	<b>Customer Centricity</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB3. check that work meets customer requirements</p> <p>SB4. deliver consistent and reliable service to internal and external customers</p>
	<b>Problem Solving</b>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB5. work with co-workers and supervisor to resolve any issues that threaten disruption, increase risk, cause delays or under-achievement of quality and targets as per the planned schedule</p>
	<b>Analytical Thinking</b>
	NA
<b>Critical Thinking</b>	
NA	

CSC/N1336

Work effectively with others

## NOS Version Control

NOS Code	CSC/N1336		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Plastics Manufacturing Machinery</li> <li>3. Textile Manufacturing Machinery</li> <li>4. Process Plant Machinery</li> <li>5. Electrical and Power Machinery</li> <li>6. Light Engineering Goods</li> </ol>	Last reviewed on	24/11/2017
Occupation	Calibration and Instrumentation	Next review date	24/11/2021



## Annexure

### Nomenclature for QP and NOS

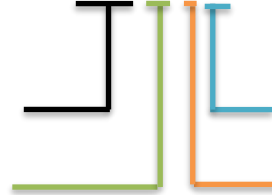
#### Qualifications Pack

9 characters

[ABC]/ Q 0101

[Insert 3 letter codes for SSC]

Q denoting Qualifications Pack



QP number (2 numbers)

Occupation (2 numbers)

#### Occupational Standard

An example of NOS with 'N'

9 characters

[ABC] / N 0101

[Insert 3 letter codes for SSC]

N denoting National Occupational Standard



OS number (2 numbers)

Occupation (2 numbers)

The following acronyms/ codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Machine Tools	01-13
Dies, Moulds and Press Tools	01-13
Plastic Manufacturing Machinery	01-13
Textile Manufacturing Machinery	01-13
Process Plant Machinery	01-13
Electrical and Power Machinery	01-13
Light Engineering Goods	01-13

Sequence	Description	Example
Three letters	Capital Goods	CSC
Slash	/	/
Next letter	Whether QP or NOS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

## Criteria For Assessment Of Trainees

**Job Role:** Technical Instrumentation

**Qualification Pack:** CSC/Q0802

**Sector Skill Council:** Capital Goods Skill Council

### Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Compulsory NOS				Marks Allocation	
Total Marks: 500					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
CSC/N0801 Calibrate hydraulic, pneumatic and mechanical measuring and control equipment	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	100	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations		3	1	2
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.check components, leads, fasteners, etc. for wear, loose connections or other faults		3	0	3

PC7.prepare and update relevant testing/calibration schedules and plans	3	0	3
PC8.carry out the testing/calibration activities in the specified sequence and in an agreed timescale	5	2	3
PC9.identify work/test requirements and define are per standard operating procedures	4	2	2
PC10.inspect and test the operation of instruments and systems to diagnose faults using testing devices	4	1	3
PC11.select correct test application principles after inspection of instrumentation systems, equipment/components	5	2	3
PC12.select appropriate test equipment in accordance with defined requirements	3	1	2
PC13.observe device isolation methods/requirements and localize	3	0	3
PC14.apply appropriate test procedures and application principles in assessing operation of instrumentation systems, equipment/components	5	1	4
PC15.report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule	2	0	2
PC16.complete relevant testing/calibration documentation accurately	2	0	2
PC17.analyse and verify test results against operational specifications to identify and localise faults	4	1	3
PC18.report potential and real faults using standard operating procedures	4	1	3
PC19.evaluate faulty conditions and plan corrective action	4	1	3
PC20.record action plan and document according to standard operating procedures	3	1	2
PC21.assess calibration of measuring and control equipment to manufacturers'specifications and/or standard operating procedures	6	2	4

	PC22.calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures		5	2	3
	PC23.undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration		5	2	3
	PC24.perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications		5	2	3
	PC25.re-commission equipment in accordance with standard operating procedures		4	1	3
	PC26.obtain help or advice from specialist if the problem is outside his/her area of competence or experience		3	0	3
	PC27.monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem		2	0	2
	PC28.complete documentation post operations as per organizational procedures		3	1	2
		<b>Total</b>	<b>100</b>	<b>26</b>	<b>74</b>
CSC/N0802 Calibrate electrical and electronic measuring and control equipment	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	100	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing calibration operations		3	1	2
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.check components, leads, fasteners, etc. for wear, loose connections or other faults		3	0	3
	PC7.prepare and update relevant testing/calibration schedules and plans		3	0	3
	PC8.carry out the testing/calibration activities in the specified sequence and in an agreed timescale		5	2	3
	PC9.identify work/test requirements and define are per standard operating procedures		4	2	2

PC10.inspect and test the operation of instruments and systems to diagnose faults using testing devices	4	1	3
PC11.select correct test application principles after inspection of instrumentation systems, equipment/components	5	2	3
PC12.select appropriate test equipment in accordance with defined requirements	3	1	2
PC13.ensure appropriate device isolation methods/requirements are observed	4	1	3
PC14.apply appropriate test procedures and application principles in testing the operation of instrumentation systems, equipment/components	4	1	3
PC15.report any instances where the testing/calibration activities cannot be fully met or where there are identified defects outside the planned schedule	2	0	2
PC16.complete relevant testing/calibration documentation accurately	2	0	2
PC17.analyse and verify test results against operational specifications to identify and localise faults	4	1	3
PC18.report potential and real faults using standard operating procedures	4	1	3
PC19.evaluate faulty conditions and plan corrective action	4	1	3
PC20.record action plan and document according to standard operating procedures	3	1	2
PC21.assess calibration of measuring and control equipment to manufacturers'specifications and/or standard operating procedures	4	1	3
PC22.calibrate equipment against appropriate physical standards using correct calibration tools, equipment, techniques using predetermined procedures	6	2	4
PC23.undertake zero, span and range checks on indicators/controllers using correct and appropriate configuration	4	1	3
PC24.perform methods of adjustment using calibration devices and document prescribed procedures and operational specifications	5	2	3
PC25.re-commission equipment in accordance with standard operating procedures	3	1	2

	PC26.refer the problem to a competent internal/external specialist if it cannot be resolved		3	0	3
	PC27.obtain help or advice from specialist if the problem is outside his/her area of competence or experience		3	0	3
	PC28.monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem		2	0	2
	PC29.complete documentation post operations as per organizational procedures		3	1	2
		<b>Total</b>	<b>100</b>	<b>25</b>	<b>75</b>
CSC/N0803 Carry out maintenance activities on instrumentation and control equipment	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work		6	2	4
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing instrumentation operations		7	2	5
	PC3.ensure work area is clean and safe from hazards		4	0	4
	PC4.ensure that all tools, equipment, power tool cables, extension leads are in asafe and usable condition		4	0	4
	PC5.obtain and use the correct version of company and/or manufacturer’s drawings and maintenance documentation		7	2	5
	PC6.produce and update relevant maintenance schedules and plans		6	0	6
	PC7.carry out the maintenance activities by appropriate techniques & procedures on a range of instrumentation and control equipment		8	2	6
	PC8.re-connect and return the system to service on completion of activities		5	0	5
	PC9.conduct maintenance activities within the limits of their personal authority		6	2	4
	PC10.carry out the maintenance activities in the specified sequence and in an agreed timescale		6	2	4
	PC11.report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule		3	0	3
	PC12.complete relevant maintenance documentation accurately		4	0	4

	PC13.dispose of waste materials in accordance with safe working practices and approved procedures		6	2	4
	PC14.identify and lead on making improvements to maintenance processes and procedures		7	2	5
	PC15.refer the problem to a competent internal/external specialist if it cannot be resolved		6	2	4
	PC16.obtain help or advice from specialist if the problem is outside candidate's area of competence or experience		5	0	5
	PC17.monitor the problem and keep the superior informed about progress or any delays in resolving the problem		4	0	4
	PC18.comply with relevant legislation, standards, policies and procedures		6	2	4
		<b>Total</b>	<b>100</b>	<b>20</b>	<b>80</b>
CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	100	4	1	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others		4	2	2
	PC6.state methods of accident prevention in the work environment of the job role		3	2	1
	PC7.state location of general health and safety equipment in the workplace		5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10.lift heavy objects safely using correct procedures		4	2	2
	PC11.apply good housekeeping practices at all times		5	2	3
	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3



	PC14.use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		3	1	2
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC24.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC25.participate in emergency procedures		4	1	3
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		4	2	2
		<b>Total</b>	<b>100</b>	<b>36</b>	<b>64</b>
CSC/N1336 Work effectively with others	PC1.receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2.pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7

	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		<b>Total</b>	<b>100</b>	<b>30</b>	<b>70</b>