QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR INSTURUMENTATION AUTOMATION SURVEILLANCE AND COMMUNICATION 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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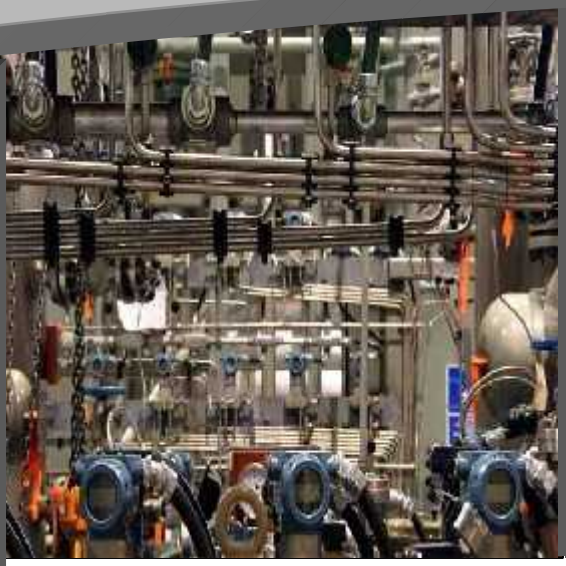

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Introduction

Qualifications Pack- Calibration Technician (Electrotechnical-1)

SECTOR: INSTRUMENTATION AUTOMATION SURVEILLANCE & COMMUNICATION

SUB-SECTOR: Instrumentation

OCCUPATION: Testing & Calibration

REFERENCE ID: IAS/Q5016

ALIGNED TO: NCO-2015/ NIL

Brief Job Description: Responsible for calibration of Electrotechnical parameters such as - AC/DC Voltage & Current, RLC and Q Below 1GHz and Temperature Simulation using authorized calibration setup and procedure in accordance with ISO/IEC 17025:2005 or equivalent standards.

Personal Attributes: This job requires the individual to be disciplined, assertive, team player, possess analytical skills and problem solving ability, effective communicator and have the ability to work under pressure.

Job Details

Qualifications Pack Code	**IAS/Q5016**		
Job Role	**Calibration Technician (Electrotechnical-1)**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Sector	**Instrumentation, Automation Surveillance and Communication**	**Drafted on**	**31/08/2017**
Sub-sector	**Instrumentation**	**Last reviewed on**	**31/08/2017**
Occupation	**Testing & Calibration**	**Next review date**	**31/08/2019**

Job Role	**Calibration Technician (Electrotechnical-1)**
Role Description	Responsible for calibration of Electrotechnical parameters such as - AC/DC Voltage & Current, RLC and Q Below 1GHz and Temperature Simulation using authorized calibration setup and procedure in accordance with ISO/IEC 17025:2005 or equivalent standards.
NSQF level	4
Minimum Educational Qualifications **Maximum Educational Qualifications**	B.Sc. (with Physics as a subject), Diploma in Mechanical, Instrumentation/ Electrical/Electronics. Final year students eligible for On Job Training and Certification Assessment. NA
Training (Suggested but not mandatory)	Practical hands-on training in Electrotechnical Metrology in a calibration laboratory.
Minimum Job Entry (Age)	19 Years
Experience	No prior experience required. On job training suggested - with supervision.
Applicable National Occupational Standards (NOS)	**Mandatory:** 1. IAS/N0511 Work Place Readiness - Electrotechnical Calibration 2. IAS/N0512 Calibration of AC/DC Voltage Sources Below 1GHz 3. IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz 4. IAS/N0514 Calibration of R,L,C,Q Below 1GHz 5. IAS/N0522 Calibration of Temperature Simulators 6. IAS/N0520 Calculations for Electrotechnical Calibration 7. IAS/N0521 Performed Preventive Maintenance – Electrotechnical Calibration Setup 8. IAS/N0204 Reporting of Tasks Performed-Calibration 9. IAS/N2105 Work Effectively with Teams

Performance Criteria	As described in relevant OS units

Definitions

Keywords /Terms	Description
Calibration	Calibration is the process of determining and verification of the physical characteristics of a system with reference to an established primary or secondary standard for that physical quantity, as prescribed by a national or international standard. Calibration assures the integrity and accuracy of a measurement device or system. Calibrations are performed according to accepted international standards so that there is global uniformity in dealing with physical quantities and their technical, trade and economic consequences.
Core skills/generic skills	Core skills or generic skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the OS these include communication related skills that are applicable to most job roles.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a data base to verify that this is the appropriate OS they are looking for.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or group of persons.
Instrumentation	Instrumentation is the variety of measuring instruments to monitor and control a process. It is the art and science of measurement and control of process variables within a production, laboratory, or manufacturing area.
Job Role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
Knowledge and understanding	Knowledge and understanding statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standards.
National occupational standards	NOS are occupational standards which apply uniquely in the Indian context.
Occupation	Occupation is a set of job roles under which role holders perform similar/related set of functions in an industry.
Organizational context	Organizational context includes the way the organization is structured and how it operates, including the operative knowledge managers have of their relevant areas of responsibility.
OS (Occupational Standards)	OS specify the standards of performance an individual must achieve when carrying out a function in the work place together with the knowledge and understanding they need to meet that standard consistently. Occupational standards are applicable both in Indian and global contexts.

Performance Criteria	Performance criteria are statements that together specify the standards of performance required when carrying out a task.
Qualification pack code	Qualification pack code is a unique reference code that identifies a qualification pack.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with, carrying out the function which has a critical impact on the quality of performance required.
Sector	Sector is a conglomeration of different business operation having similar businesses 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.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Traceability	Ability to correlate calibration of equipment to national and international standards - ultimately to secondary and primary standards.
Unit Code	Unit code is a unique identifier for an 'OS' unit which can be denoted with either 'O' or 'N'.
Unit title	Unit title gives clear overall statement about what the incumbent should be able to do.

Acronyms

Keywords /Terms	Description
PM	Preventive Maintenance
SOP	Standard Operating Procedures
UUC	Unit Under Calibration
Electrotechnical Metrology	The science of measurement. Metrology includes all aspects, theoretical as well as practical, relating to measurements and their uncertainty.
Reference Standard	Standard, generally having the highest metrological quality available at a given location or in a given organization, from which measurements made there are derived.
Working Standard	Standard that is used routinely to calibrate or check material measures, measuring instruments or reference materials.
Reference Instrument	In the context of this document, the Reference Instruments are those used for calibration. These are in fact Working Standards, with calibration traceability.

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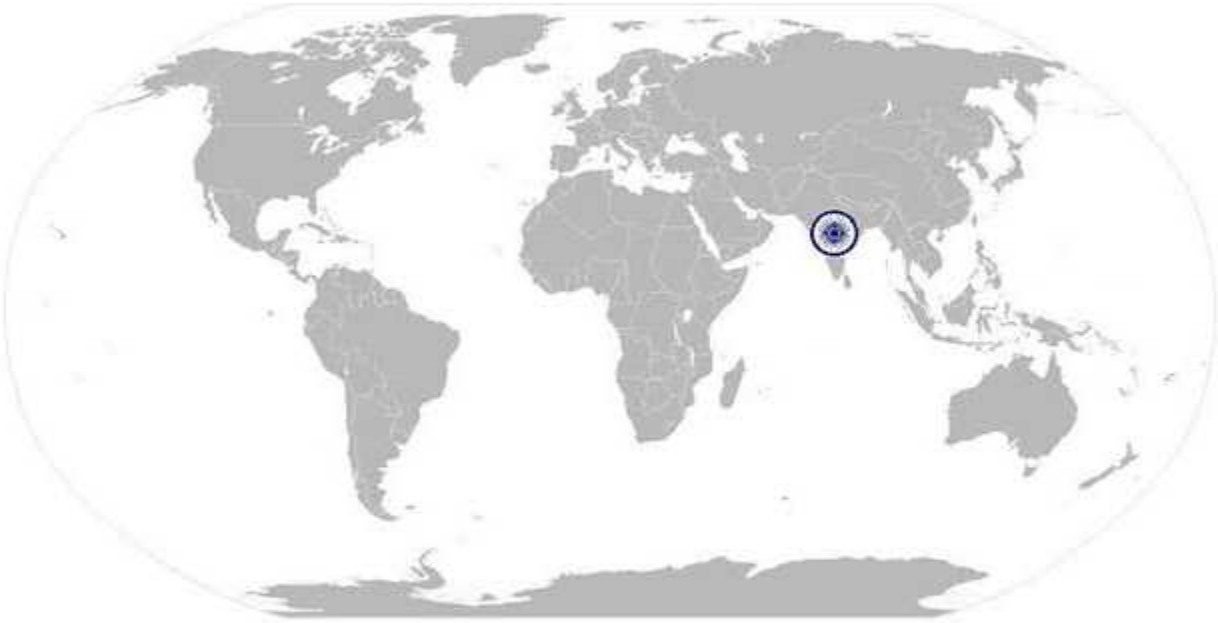
National Occupational Standard



Overview

This unit is about maintaining Readiness and Usability of Electrotechnical Calibration setup at regular intervals.

National Occupational Standard

Unit Code	IAS/N0511
Unit title (Task)	**Work Place Readiness - Electro-Technical Calibration**
Description	The OS unit is about ensuring the appropriate calibration environment as well as the Readiness and Usability of calibration system and Safety at the workplace as mandated by the organization. The individual follows organization specified handling methods and keeps the calibration equipment and setup in good order.
Scope	The scope covers ensuring proper environment, including: • Clean and Uncluttered Workplace • Vibration • Acoustic Noise • Illumination • Temperature and Humidity • AC Magnetic Field • Electromagnetic Interference (EMI) • Earthing and Ground Isolation • Quality of Power Supply and THD • Dust and external air pressure • Safety Precautions • Availability and Usability of calibration instruments and system • Workplace Operational Guidelines
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Maintain Workplace Cleanliness	To be competent, the individual must be able to: PC1. Perform Workplace Checks using prescribed by checklists and organizational norms and report any deviations. PC2. Check for cleanliness of work area and equipment PC3. Ensure an uncluttered workplace
Ensure Vibration norms	To be competent, the individual must be able to: PC4. Check / Feel for any abnormal vibrations generated by central air-conditioning plants, vehicular traffic and other sources. PC5. If any vibration is felt which is unusual, then try to locate the source of vibration. Check if special/ protective devices like vibration free tables and pillars etc., isolating the equipment from the floor, are affected in any way. PC6. Report any deviations and findings to the Supervisor and the concerned

	department. PC7. If the vibration level is above specified limits, Calibration operation may be suspended. Refer to organization SOP for the quantitative measurement of vibration and relation guidelines.
Ensure Acoustic Noise norms	To be competent, the individual must be able to: PC8. Check / Listen for any abnormal noise in the calibration area. Refer to SOP for acceptable noise level - usually less than 60dBA. PC9. If any noise is felt which is unusual, then try to locate the source of noise. PC10. Report any deviations and findings to the Supervisor and the concerned department. PC11. If the noise level affects the Calibration process, then the operation may be suspended. Refer to organization SOP for the quantitative measurement of noise and related guidelines.
Ensure Lighting Environment norms	To be competent, the individual must be able to: PC12. Check for lighting / associated electricals at Electrotechnical Calibration Installation. Report any deviations to electrical department. PC13. Check for adequate lighting and working of associated electrical fittings in the Calibration area. The recommended level of illumination is 250-500 Lux on the working table, or as specified in the SOP. PC14. Check for temporary/unsafe electrical wiring
Ensure Environment norms	To be competent, the individual must be able to: PC15. Check for ambient temperature and humidity in the Calibration area. Refer to organization SOP for the quantitative measurement of temperature and humidity and the related guidelines. PC16. Report any deviations to the concerned department. PC17. If the environment parameters are likely to adversely affect the required accuracy of measurement, then report to the Supervisor and seek guidance about performing calibration.
Ensure EMI/EMC and Stray Magnetic Fields Norms	To be competent, the individual must be able to: PC18. Ensure the norms specified in SOP are observed for intensity and location of magnetic field sources like, transformers, looped wires, ferrous materials etc. in order to minimize magnetic interference in the measurements, especially for magnetic measurements such as inductor, transformers etc. PC19. Ensure EMI/EMC norms are observed per SOP.

	PC20. Report any deviations to the concerned department.
Ensure Earthing and Ground Isolation	PC21. Ensure earthing norms per SOP for mains in accordance with relevant specification IS:3043. General standards are earth resistance to less than 1 ohm and earth to neutral voltage to less than 1 volt. PC22. Report any deviations to the concerned department.
Ensure Quality of Power Supply and THD	To be competent, the individual must be able to: PC23. Ensure that the power supply of right quality (voltage, frequency, THD, transients, regulation etc.) as specified in SOP is available - usually from a UPS. Check that any isolation transformers and filters etc. installed are not tampered with and the hum interference is within limits. PC24. Ensure that operation of heavy loads in the premises or nearby locations does not cause any dip in voltage or transient currents. PC25. Report any deviations to the concerned department.
Ensure Dust and External Air Pressure norms	To be competent, the individual must be able to: PC26. Ensure that the laboratory is free from dust and external air pressure. Positive air pressure, is normally maintained inside the laboratory to avoid ingress of dust. PC27. Report any deviations to the concerned department.
Ensure Safety Precautions	To be competent, the individual must be able to: PC28. Ensure availability of suitable fire extinguishing equipment for possible fire hazards in the laboratory, per SOP. PC29. Ensure familiarity with method of giving the treatment in case of electric shock. Wall chart showing the procedure should be placed near the power supply switchgear and at other prominent places as prescribed under Indian Electricity Rules 1956. PC30. Report any deviations to the concerned department.
Ensure Availability and Usability of calibration instruments and system	To be competent, the individual must be able to: PC31. Check for availability of instruments in the Electrotechnical Metrology calibration setup. PC32. Check availability of electrical power and the quality (whether UPS backed, voltage and frequency) as specified in the SOP
Maintain Workplace Operational Guidelines	To be competent, the individual must be able to: PC33. Handle equipment in recommended and safe manner. PC34. Uses hand gloves of specified material for handling the UUC and Reference so that these are not soiled and to avoid heat transfer to

	Reference equipment or UUC during Calibration which may otherwise drastically affect the results.
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	The individual on the job needs to know and understand: KA1. Organization SOPs for various calibrations performed KA2. The requirements of maintaining environment and cleanliness of the workplace for Calibration operation and how it impacts the organization process and business. KA3. The role of calibration in the organization (whether part of the end user Production and Quality Assurance process or of a calibration service provider) KA4. The impact of calibration quality on the company business
B. Technical Knowledge	The individual on the job needs to know and understand: KB1. The Calibration Technician knows and understands Electrotechnical Calibration process and its impact on calibration accuracy, which includes: KB2. Calibration methods KB3. Different types of working and reference standards KB4. Connect, Setup and Operate different type of instruments KB5. Environment requirements and its impact on calibration quality KB6. Check and ensure that various environment variables are within limits
Skill(S) [Optional]	
A. Core Skills / Generic Skills	**Writing skills**
	The individual on the job needs to know and understand: SA1. Use Formats and check list for workplace readiness SA2. Write emails and messages about site related issues
	Reading Skills
	The user/individual on the job needs to know and understand: SA3. Read product literature and manuals relevant for the job SA4. Read the company information about working practices at the site SA5. Read the information displayed at the workplace
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand: SA6. Describe site conditions and issues to co-workers and supervisor SA7. Communicate to the management in meetings about site issues to get their support

	SA8. Interact with coworkers and gather information related to process and site conditions
B. Professional Skills	**Decision Making**
	The individual on the job needs to know and understand: SB1. Make decisions pertaining to the concerned area of work
	Plan and Organize
	The individual on the job needs to know and understand: SB2. Prioritize daily activities for the upkeep of calibration operation through ensuring availability of the calibration setup and its components.
	Customer Centricity
	The user/individual on the job needs to know and understand: SB3. Real needs of the customer and suggest most appropriate solution SB4. Support customer when they need help
	Problem Solving
	The user/individual on the job needs to know and understand: SB5. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB6. Identify immediate or temporary solutions to resolve delays
	Analytical Thinking
	The user/individual on the job needs to know and understand: SB7. Use the existing information to arrive at actionable decision points SB8. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand: SB9. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action SB10. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

NOS Version Control

NOS Code	IAS/N0511		
Credits(NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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IAS/N0512 Calibration of AC/DC Voltage Sources Below 1GHz

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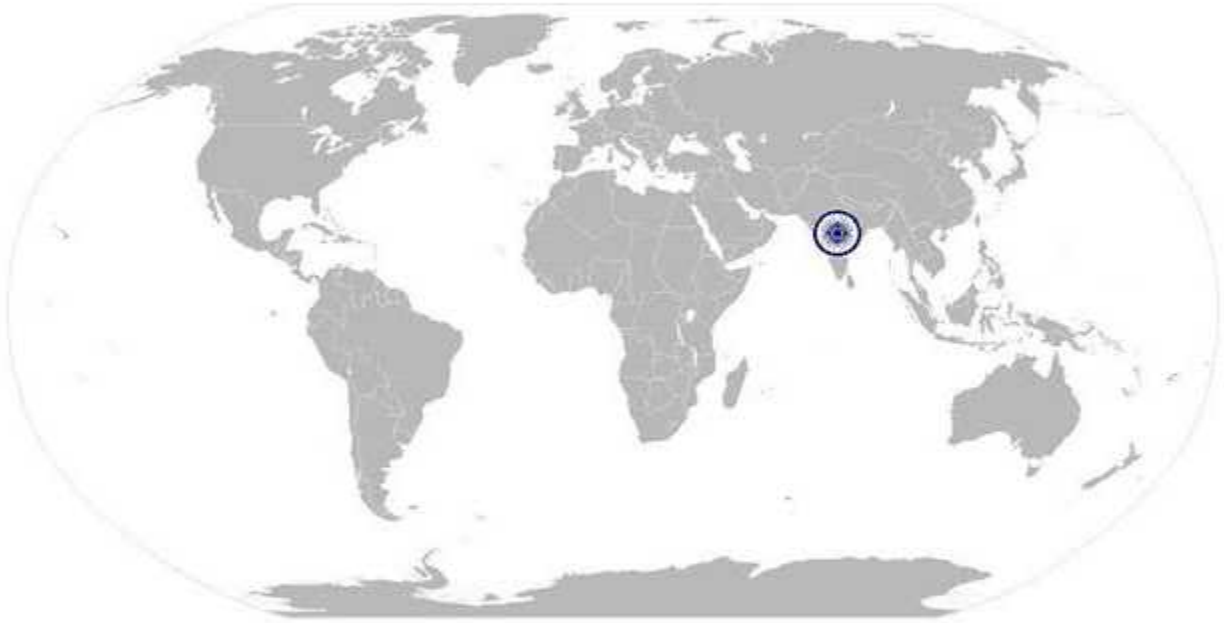
National Occupational Standard



Overview

The OS unit is about calibration of a range of AC/DC Voltage Sources, Function Generators and similar instruments according to organization SOP.

IAS/N0512 **Calibration of AC/DC Voltage Sources Below 1GHz**

National Occupational Standard

Unit Code	**IAS/N0512**
Unit title (Task)	**Calibration of AC/DC Voltage Sources Below 1GHz**
Description	The OS unit is about calibration of a range of AC/DC Voltage Sources, Function Generators and similar instruments according to organization SOP.
Scope	The Scope relates to: • Plan and prepare for calibration • Perform Measurements • Perform Calculations and prepare Report • Restore the Reference instruments and UUC to their respective condition and places
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Plan and prepare for calibration	To be competent, the individual must be able to: PC1. Note the method of calibration, as requested in the Job Order PC2. Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method PC3. Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.) PC4. Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean) PC5. Note all parameters to measure for the requested calibration (Voltage, Frequency, Phase, THD, Modulation, IMD etc.) PC6. Note all parameters ranges to calibrate PC7. Note the number of readings to be taken for each parameter PC8. Note the Reference Instruments and Components (i.e. divider etc.) to use for the parameters PC9. Wear gloves while handling instruments PC10. Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates) PC11. Verify that the measurement environment is appropriate for the reference instruments PC12. Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration PC13. Switch on the Reference equipment and the UUC PC14. Select appropriate functions, parameters and range for the Reference and the UUC PC15. If the measurements are automated, setup the recommended

	automation environment, enable the software and enter the required configuration parameters, per SOP PC16. Record readings of ambient temperature and relative humidity using recommended devices PC17. Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP
Perform Measurements	The individual must be able to perform measurement steps according to organization SOP. PC18. Select a parameter from the list of parameters to measure PC19. Measure the chosen parameter using the reference instrument and record the reading PC20. Measure the chosen parameter using the UUC and record the reading PC21. Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered. PC22. If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response PC23. Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices
Perform Post Processing, Recording and communication of results	The individual must be able to perform post measurement processing steps to derive the calibration results from the measurement data, as specified in the SOP. PC24. Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed PC25. Use form/format specified in the SOP for performing calculations PC26. Perform the required calculations using calculator or software as specified PC27. Perform Type 'A' uncertainty calculations based on measurement data, per SOP PC28. Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements. PC29. Record the results, including uncertainty in the specified format

	PC30. Prepare Report in the format specified in the SOP PC31. Store and share report with the designated persons
Restore the Reference instruments and UUC to their respective condition and places	To be competent, the individual must be able to: PC32. Return the Reference instruments and accessories to their recommended storage condition and position PC33. Return the UUC to its recommended storage condition PC34. Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	To be competent, the user /individual must be able to: KA1. The requirements of performing Electrotechnical Calibration and how it impacts organization process and business. KA2. The role of calibration in the organization (whether part of the end user Production and Quality Assurance process or of a Calibration Service Provider) KA3. The Certification of the organization and their capability to perform calibration tests according to accepted level of standards. KA4. The impact of calibration quality on the company business KA5. Knows about the Standard Operating Procedures and its importance KA6. Follows the SOPs rigorously and takes guidance from the Calibration Supervisor when in doubt. KA7. Records any non-compliance to SOP and reports it to the Calibration Supervisor and takes guidance.
B. Technical Knowledge	To be competent, the individual must: KB1. Knows about and understands how Electrotechnical Calibration is performed. KB2. Knows about the sources of errors in the calibration process, how these are avoided and its impact on calibration accuracy. KB3. Familiar with: • What is Calibration • Why is calibration needed • Traceability of the calibration of instruments performing the tests • What are Electrotechnical Devices • Types of Electrotechnical Measuring Devices, ranges and applications • Types of Calibration • Sources of inaccuracies in Electrotechnical measurements and how to avoid / minimize these • Equipment needed for Electrotechnical Calibration • Deriving calibration results - data processing and interpretation
Skill(S)	

IAS/N0512 Calibration of AC/DC Voltage Sources Below 1GHz

A. Core Skills / Generic Skills	**Writing skills**
	The individual on the job needs to know and understand how to: SA1. Use Formats and check list for Electrotechnical calibration and reports SA2. Write emails and messages about calibration related issues
	Reading Skills
	The individual on the job needs to read and understand: SA3. Company policy related to Electrotechnical calibration SA4. Terminology, symbols, codes, standards, methods and common practices related to Electrotechnical Calibration SA5. Data processing steps, Uncertainty Calculations and reporting of results related to Electrotechnical calibration. SA6. Formats and check list for Electrotechnical Calibration
	Oral Communication (Listening and Speaking skills)
	The individual on the job needs to know and understand how to: SA7. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA8. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**
	The individual on the job needs to know and understand how to: SB1. Make decisions about what calibration to perform and consult Supervisor if needed
	Plan and Organize
	The individual on the job needs to know and understand how to: SB2. Prioritize daily tasks and batches of calibration efficiently and effectively to meet client and company needs
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. R eal needs of the customer and suggest most appropriate solution SB4. Support customer when they need help
	Problem Solving

IAS/N0512 Calibration of AC/DC Voltage Sources Below 1GHz

	The individual on the job needs to know and understand how to: SB5. Diagnose reasons for any down time in the calibration setup SB6. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB7. Use the existing information to arrive at actionable decision points SB8. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB9. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action

NOS Version Control

NOS Code	IAS/N0512		
Credits (NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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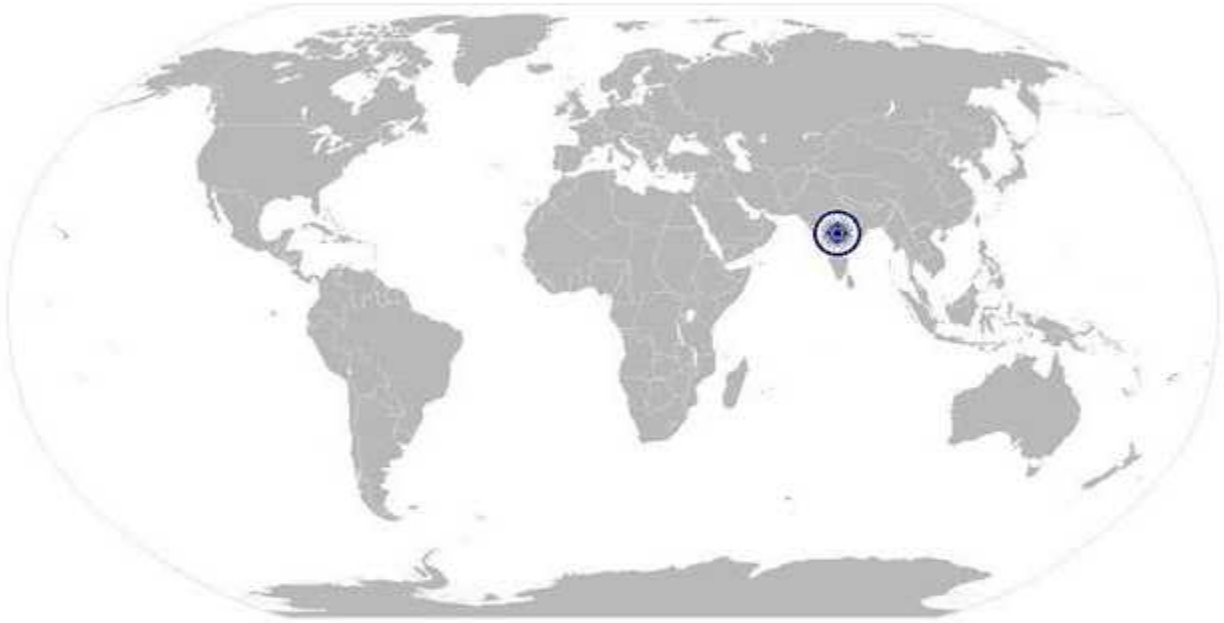
National Occupational Standard



Overview

The OS unit is about calibration of a range of AC/DC Current Sources, Function Generators and similar instruments according to organization SOP.

IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz

National Occupational Standard

Unit Code	**IAS/N0501**
Unit title (Task)	**Calibration of AC/DC Current Sources Below 1GHz**
Description	This OS unit is about calibration of a range of AC/DC Current Sources, Function Generators and similar instruments according to organization SOP.
Scope	The Scope relates to: • Plan and prepare for calibration • Perform Measurements • Perform Calculations and prepare Report • Restore the Reference instruments and UUC to their respective condition and places
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Plan and Prepare for Calibration	To be competent, the individual must be able to: PC1. Note the method of calibration, as requested in the Job Order PC2. Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method PC3. Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.) PC4. Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean) PC5. Note all parameters to measure for the requested calibration (Current, Frequency, Phase, THD, Modulation, IMD etc.) PC6. Note all parameters ranges to calibrate PC7. Note the number of readings to be taken for each parameter PC8. Note the Reference Instruments and Components (i.e. shunt etc.) to use for the parameters PC9. Wear gloves while handling instruments PC10. Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates) PC11. Verify that the measurement environment is appropriate for the reference instruments PC12. Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration PC13. Switch on the Reference equipment and the UUC

	PC14. Select appropriate functions, parameters and range for the Reference and the UUC PC15. If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP PC16. Record readings of ambient temperature and relative humidity using recommended devices PC17. Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP
Perform Measurements	The individual must be able to perform measurement steps according to organization SOP. PC18. Select a parameter from the list of parameters to measure PC19. Measure the chosen parameter using the reference instrument and record the reading PC20. Measure the chosen parameter using the UUC and record the reading PC21. Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered. PC22. If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response PC23. Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices
Perform Post Processing, Recording and Communication of Results	The individual must be able to perform post measurement processing steps to derive the calibration results from the measurement data, as specified in the SOP. PC24. Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed PC25. Use form/format specified in the SOP for performing calculations PC26. Perform the required calculations using calculator or software as specified PC27. Perform Type 'A' uncertainty calculations based on measurement data, per SOP PC28. Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under

	Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements. PC29. Record the results, including uncertainty in the specified format PC30. Prepare Report in the format specified in the SOP PC31. Store and share report with the designated persons
Restore the Reference Instruments and UUC to their Respective Condition and Places	To be competent, the individual must be able to: PC32. Return the Reference instruments and accessories to their recommended storage condition and position PC33. Return the UUC to its recommended storage condition PC34. Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	To be competent, the individual must be able to: KA8. The requirements of performing Electrotechnical Calibration and how it impacts organization process and business. KA9. The role of calibration in the organization (whether part of the end user Production and Quality Assurance process or of a Calibration Service Provider) KA10. The Certification of the organization and their capability to perform calibration tests according to accepted level of standards. KA11. The impact of calibration quality on the company business KA12. Knows about the Standard Operating Procedures and its importance KA13. Follows the SOPs rigorously and takes guidance from the Calibration Supervisor when in doubt. KA14. Records any non-compliance to SOP and reports it to the Calibration Supervisor and takes guidance.

IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz

B. Technical Knowledge	To be competent, the individual must: KB4. Knows about and understands how Electrotechnical Calibration is performed. KB5. Knows about the sources of errors in the calibration process, how these are avoided and its impact on calibration accuracy. KB6. Familiar with: • What is Calibration • Why is calibration needed • Traceability of the calibration of instruments performing the tests • What are Electrotechnical Devices • Types of Electrotechnical Measuring Devices, ranges and applications • Types of Calibration • Sources of inaccuracies in Electrotechnical measurements and how to avoid / minimize these • Equipment needed for Electrotechnical Calibration • Deriving calibration results - data processing and interpretation
Skill(S)	
A. Core Skills / Generic Skills	**Writing skills** The individual on the job needs to know and understand how to: SA9. Use Formats and check list for Electrotechnical calibration and reports SA10. Write emails and messages about calibration related issues
	Reading Skills The individual on the job needs to read and understand: SA11. Company policy related to Electrotechnical calibration SA12. Terminology, symbols, codes, standards, methods and common practices related to Electrotechnical Calibration SA13. Data processing steps, Uncertainty Calculations and reporting of results related to Electrotechnical calibration. SA14. Formats and check list for Electrotechnical Calibration
	Oral Communication (Listening and Speaking skills) The individual on the job needs to know and understand how to: SA15. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA16. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**

IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz

	The individual on the job needs to know and understand how to: SB10 . Make decisions about what calibration to perform and consult Supervisor if needed
	Plan and Organize
	The individual on the job needs to know and understand how to: SB11. Prioritize daily tasks and batches of calibration efficiently and effectively to meet client and company needs
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB12. Real needs of the customer and suggest most appropriate solution SB13. Support customer when they need help
	Problem Solving
	The individual on the job needs to know and understand how to: SB14. Diagnose reasons for any down time in the calibration setup SB15. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB16. Use the existing information to arrive at actionable decision points SB17. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB18. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action

IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz

NOS Version Control

NOS Code	IAS/N0513		
Credits (NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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IAS/N0514 **Calibration of R,L,C,Q Below 1GHz**

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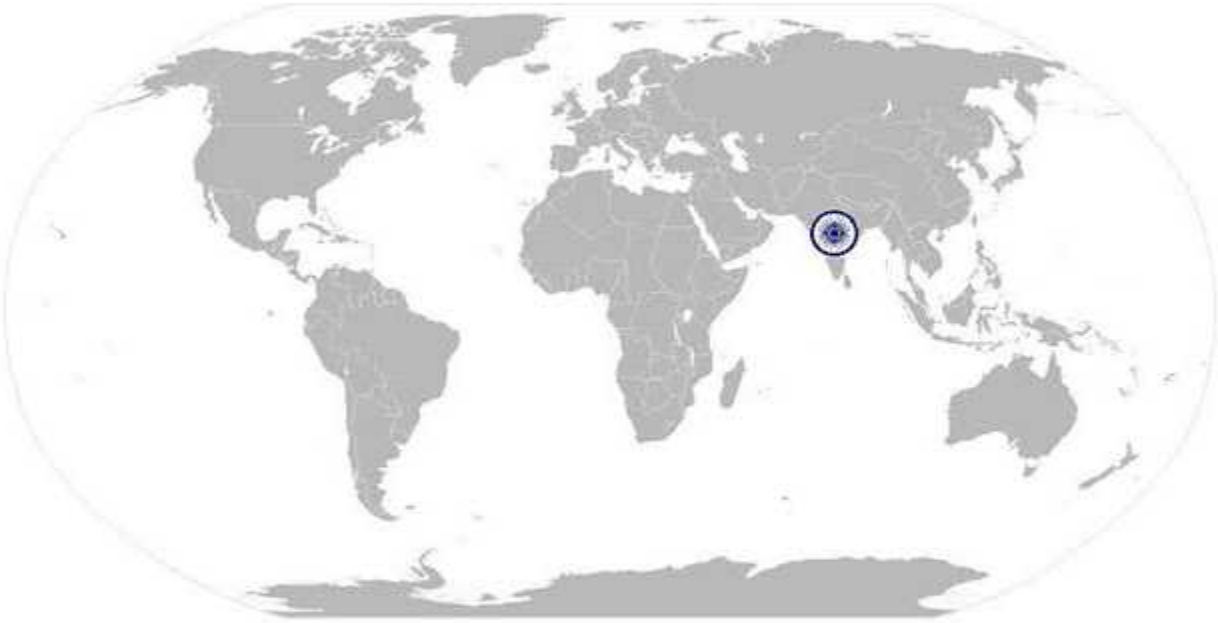
National Occupational Standard



Overview

The OS unit is about calibration of a range of passive Resistors, Inductors and Capacitors (R,L,C) either as single components or a combination such as decade boxes, according to organization SOP.

National Occupational Standard

Unit Code	IAS/N0514
Unit title (Task)	**Calibration of R,L,C,Q Below 1GHz**
Description	This OS unit is about calibration of a range of passive Resistors, Inductors and Capacitors (R,L,C) either as single components or a combination such as decade boxes, according to organization SOP.
Scope	This unit/task covers the following: • Plan and prepare for calibration • Perform Measurements • Perform Calculations and prepare Report • Restore the Reference instruments and UUC to their respective condition and places
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Plan and prepare for calibration	To be competent, the individual must be able to: PC1. Note the method of calibration, as requested in the Job Order PC2. Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method PC3. Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.) PC4. Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean, no broken or loose terminals) PC5. Note all parameters to measure for the requested calibration (Voltage, Current, Frequency, Phase angle, Loss Tangent, Leakage Current, and Hysteresis etc.) PC6. Note all parameters ranges to calibrate PC7. Note the number of readings to be taken for each parameter PC8. Note the Reference Instruments and Components (i.e. divider etc.) to use for the parameters PC9. Wear gloves while handling instruments PC10. Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates) PC11. Verify that the measurement environment is appropriate for the reference instruments PC12. Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration PC13. Switch on the Reference equipment and the UUC PC14. Select appropriate functions, parameters and range for the Reference

	and the UUC PC15. If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP PC16. Record readings of ambient temperature and relative humidity using recommended devices PC17. Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP
Perform Measurements	The individual must be able to perform measurement steps according to organization SOP. PC18. Select a parameter from the list of parameters to measure PC19. Measure the chosen parameter using the reference instrument and record the reading PC20. Measure the chosen parameter using the UUC and record the reading PC21. Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered. PC22. If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response PC23. Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices
Perform Post Processing, Recording and communication of results	The individual must be able to perform post measurement processing steps to derive the calibration results from the measurement data, as specified in the SOP. PC24. Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed PC25. Use form/format specified in the SOP for performing calculations PC26. Perform the required calculations using calculator or software as specified PC27. Perform Type 'A' uncertainty calculations based on measurement data, per SOP PC28. Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under

	Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements. PC29. Record the results, including uncertainty in the specified format PC30. Prepare Report in the format specified in the SOP PC31. Store and share report with the designated persons
Restore the Reference instruments and UUC to their respective condition and places	To be competent, the individual must be able to: PC32. Return the Reference instruments and accessories to their recommended storage condition and position PC33. Return the UUC to its recommended storage condition PC34. Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	To be competent, the individual must be able to: KA15. The requirements of performing Electrotechnical Calibration and how it impacts organization process and business. KA16. The role of calibration in the organization (whether part of the end user Production and Quality Assurance process or of a Calibration Service Provider) KA17. The Certification of the organization and their capability to perform calibration tests according to accepted level of standards. KA18. The impact of calibration quality on the company business KA19. Knows about the Standard Operating Procedures and its importance KA20. Follows the SOPs rigorously and takes guidance from the Calibration Supervisor when in doubt. KA21. Records any non-compliance to SOP and reports it to the Calibration Supervisor and takes guidance.

IAS/N0514 **Calibration of R,L,C,Q Below 1GHz**

B. Technical Knowledge	To be competent, the individual must: KB7. Knows about and understands how Electrotechnical Calibration is performed. KB8. Knows about the sources of errors in the calibration process, how these are avoided and its impact on calibration accuracy. KB9. Familiar with: • What is Calibration • Why is calibration needed • Traceability of the calibration of instruments performing the tests • What are Electrotechnical Devices • Types of Electrotechnical Measuring Devices for measuring R,L,C and Q, their ranges and applications • Types of Calibration • Sources of inaccuracies in Electrotechnical measurements and how to avoid / minimize these • Equipment needed for Electrotechnical Calibration • Deriving calibration results - data processing and interpretation
Skill(S)	
A. Core Skills / Generic Skills	**Writing skills** The individual on the job needs to know and understand how to: SA17. Use Formats and check list for Electrotechnical calibration and reports SA18. Write emails and messages about calibration related issues
	Reading Skills The individual on the job needs to read and understand: SA19. Company policy related to Electrotechnical calibration SA20. Terminology, symbols, codes, standards, methods and common practices related to Electrotechnical Calibration SA21. Data processing steps, Uncertainty Calculations and reporting of results related to Electrotechnical calibration. SA22. Formats and check list for Electrotechnical Calibration
	Oral Communication (Listening and Speaking skills) The individual on the job needs to know and understand how to: SA23. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA24. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**

	The individual on the job needs to know and understand how to: SB19 . Make decisions about what calibration to perform and consult Supervisor if needed
	Plan and Organize
	The individual on the job needs to know and understand how to: SB20. Prioritize daily tasks and batches of calibration efficiently and effectively to meet client and company needs
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB21. Real needs of the customer and suggest most appropriate solution SB22. Support customer when they need help
	Problem Solving
	The individual on the job needs to know and understand how to: SB23. Diagnose reasons for any down time in the calibration setup SB24. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB25. Use the existing information to arrive at actionable decision points SB26. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB27. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action

NOS Version Control

NOS Code	IAS/N0514		
Credits (NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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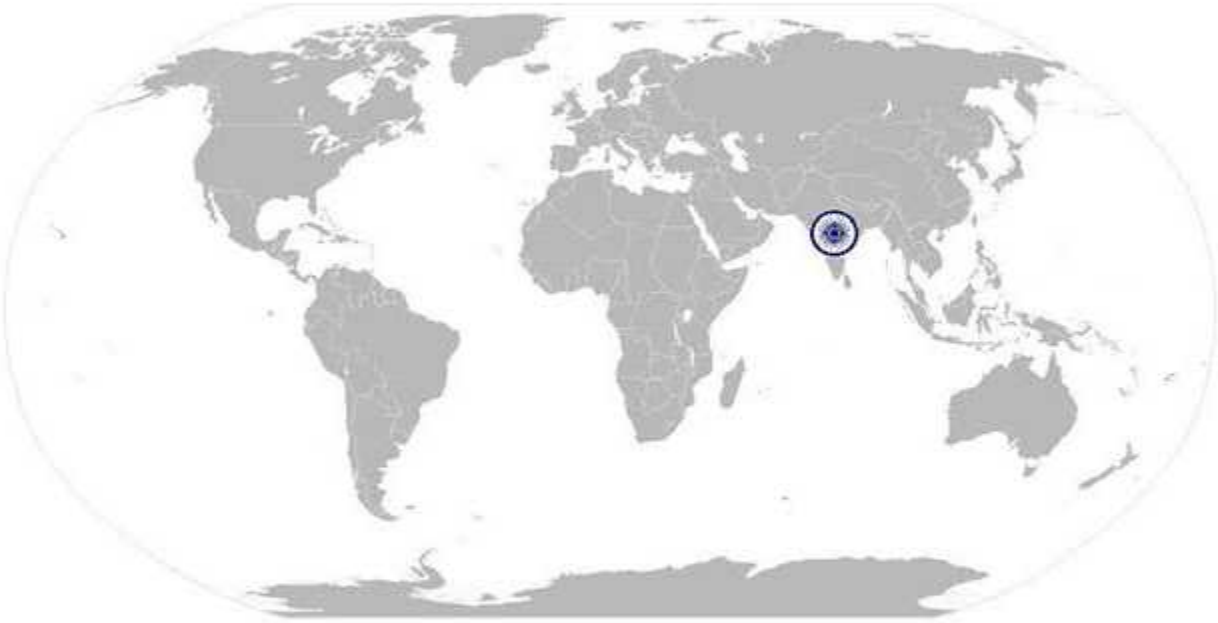
National Occupational Standard



Overview

This unit is about Calibration of Temperature Simulators according to the Standard Operating Procedures (SOP) of the organization.

National Occupational Standard

Unit Code	**IAS/N0522**
Unit title (Task)	**Calibration of Temperature Simulators**
Description	This OS unit is about calibration of a range of Temperature Simulation equipment for standard Thermocouples and RTDs according to organization SOP.
Scope	The Scope relates to: • Plan and prepare for calibration • Perform Measurements • Perform Calculations and prepare Report • Restore the Reference instruments and UUC to their respective condition and places
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Plan and prepare for calibration	To be competent, the individual must be able to: PC1. Note the method of calibration, as requested in the Job Order PC2. Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method PC3. Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.) PC4. Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean, functional) PC5. Note type(s) of Simulations to be calibrated (one or more Thermocouple types, one or more RTD types). The characteristics could be (mV vs Temperature Indication for Thermocouple simulator) or (Resistance vs Temperature Indication for RTD simulator). PC6. Note all ranges to calibrate PC7. Note the number of readings to be taken for each type and range PC8. Note the Reference Instruments to use for the calibration (i.e. Digital Voltmeter, Resistance Meter - 4 wire etc.) PC9. Wear gloves while handling instruments PC10. Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates) PC11. Verify that the measurement environment is appropriate for the reference instruments PC12. Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration.

	Ensure that the RTD calibration is done in 4-wire mode. PC13. Switch on the Reference equipment and the UUC PC14. Select appropriate functions, parameters and range for the Reference and the UUC PC15. If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP PC16. Record readings of ambient temperature and relative humidity using recommended devices PC17. Allow the Reference equipment and the UUC to stabilize, as recommended by the manufacturer or SOP
Perform Measurements	The individual must be able to perform measurement steps according to organization SOP. PC18. Select a parameter from the list of parameters to measure PC19. Measure the chosen parameter using the reference instrument and record the reading PC20. Measure the chosen parameter using the UUC and record the reading PC21. Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered. PC22. If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response PC23. Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices
Perform Post Processing, Recording and communication of results	The individual must be able to perform post measurement processing steps to derive the calibration results from the measurement data, as specified in the SOP. PC24. Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed PC25. Use form/format specified in the SOP for performing calculations PC26. Perform the required calculations using calculator or software as specified PC27. Perform Type 'A' uncertainty calculations based on measurement data, per SOP PC28. Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under

	Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements. PC29. Record the results, including uncertainty in the specified format PC30. Prepare Report in the format specified in the SOP PC31. Store and share report with the designated persons
Restore the Reference instruments and UUC to their respective condition and places	To be competent, the individual must be able to: PC32. Return the Reference instruments and accessories to their recommended storage condition and position PC33. Return the UUC to its recommended storage condition PC34. Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	To be competent, the individual must be able to: KA1. The requirements of performing Electrotechnical Calibration and how it impacts organization process and business. KA2. The role of calibration in the organization (whether part of the end user Production and Quality Assurance process or of a Calibration Service Provider) KA3. The Certification of the organization and their capability to perform calibration tests according to accepted level of standards. KA4. The impact of calibration quality on the company business KA5. Knows about the Standard Operating Procedures and its importance KA6. Follows the SOPs rigorously and takes guidance from the Calibration Supervisor when in doubt. KA7. Records any non-compliance to SOP and reports it to the Calibration Supervisor and takes guidance.

IAS/N0522 **Calibration of Temperature Simulators**

B. Technical Knowledge	To be competent, the individual must: KB1. Knows about and understands how Electrotechnical Calibration is performed. KB2. Knows about the sources of errors in the calibration process, how these are avoided and its impact on calibration accuracy. KB3. Familiar with: • What is Calibration • Why is calibration needed • Traceability of the calibration of instruments performing the tests • What are Electrotechnical Devices • Types of Electrotechnical Measuring Devices, ranges and applications • Types of Calibration • Sources of inaccuracies in Electrotechnical measurements and how to avoid / minimize these • Equipment needed for Electrotechnical Calibration • Deriving calibration results - data processing and interpretation
Skill(S)	
A. Core Skills / Generic Skills	**Writing skills** The individual on the job needs to know and understand how to: SA1. Use Formats and check list for Electrotechnical calibration and reports SA2. Write emails and messages about calibration related issues
	Reading Skills The individual on the job needs to read and understand: SA3. Company policy related to Electrotechnical calibration SA4. Terminology, symbols, codes, standards, methods and common practices related to Electrotechnical Calibration SA5. Data processing steps, Uncertainty Calculations and reporting of results related to Electrotechnical calibration. SA6. Formats and check list for Electrotechnical Calibration
	Oral Communication (Listening and Speaking skills) The individual on the job needs to know and understand how to: SA7. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA8. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**

	The individual on the job needs to know and understand how to: SB1. Make decisions about what calibration to perform and consult Supervisor if needed
	Plan and Organize
	The individual on the job needs to know and understand how to: SB2. Prioritize daily tasks and batches of calibration efficiently and effectively to meet client and company needs
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. Real needs of the customer and suggest most appropriate solution SB4. Support customer when they need help
	Problem Solving
	The individual on the job needs to know and understand how to: SB5. Diagnose reasons for any down time in the calibration setup SB6. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB7. Use the existing information to arrive at actionable decision points SB8. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB9. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action

NOS Version Control

NOS Code	IAS/N0522		
Credits (NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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IAS/N0520 Calculation of Electrotechnical Calibration Parameters

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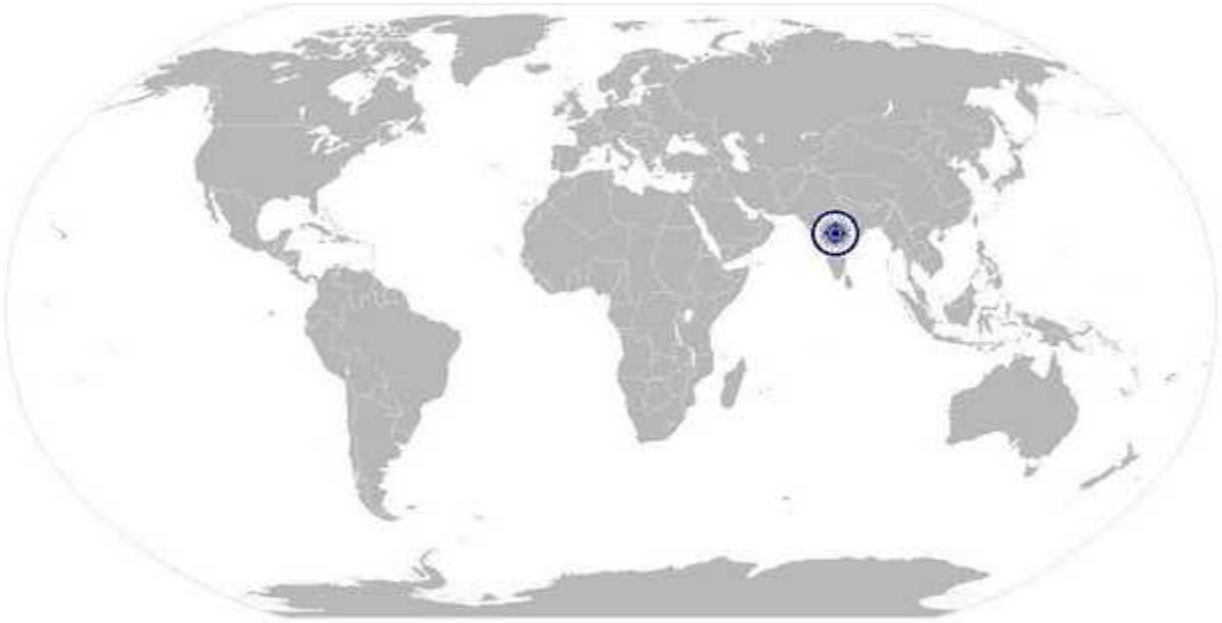
National Occupational Standard



Overview

This unit is about Calculation of Electrotechnical Calibration Parameters according to the Standard Operating Procedures (SOP) of the organization.

IAS/N0520 Calculation of Electrotechnical Calibration Parameters

National Occupational Standard

Unit Code	**IAS/N0520**
Unit title (Task)	**Calculation of Electrotechnical Calibration Parameters**
Description	The OS unit is about Calculation of Electrotechnical Calibration Parameters according to the SOP of the organization
Scope	The Scope relates to: • Perform Type 'A' calculations using the measurement data recorded for the UUC type and requested calibration service. • Perform Type 'B' calculations based on the calibration certificates of the working standards and other data relating to stability • Determine Uncertainty • Prepare report using the calculated data
Performance Criteria (PC) with respect to the scope	
Element	**Performance Criteria**
Perform Calculations using the Measurement Data Recorded	The individual is able to perform calculation of: PC1. Type 'A' uncertainty calculations based on the measurement data on the UUC, using the equations and procedures specified in the SOP
Perform Calculations using the Organization Data	The individual is able to perform calculation of: PC2. Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements.
Perform Uncertainty Calculations	The individual is able to perform calculation of: PC3. Calculate Measurement Uncertainty for the UUC type, following the procedures specified in the SOP

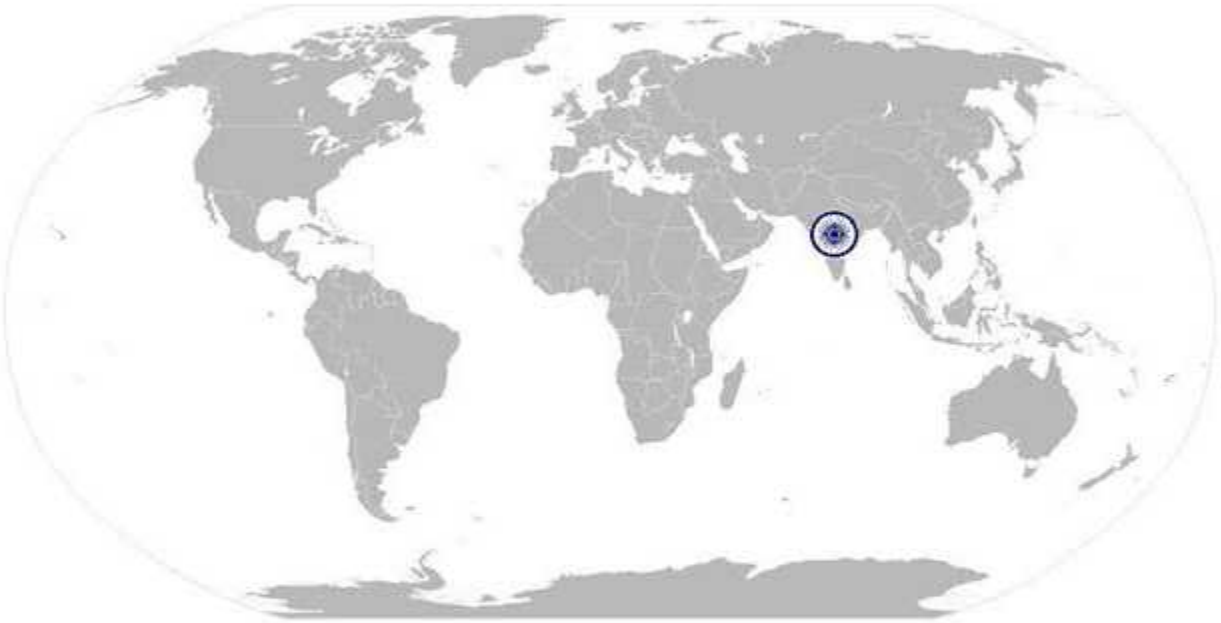
IAS/N0520 Calculation of Electrotechnical Calibration Parameters

Prepare report using the calculated data	PC4. Prepare calibration report using the calculated data per format specified in SOP PC5. Store the report in the prescribed device PC6. Share the report with the designated persons
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its process relevant to areas of responsibilities)	The individual on the job needs to: KA1. The Certification of the organization and their capability to perform calibration tests according to accepted level of standards. KA2. The impact of calibration quality on the company business KA3. Knows about the Standard Operating Procedures and its importance KA4. Records any non-compliance to SOP and reports it to the Calibration Supervisor and takes guidance.
B. Technical Knowledge	The individual on the job needs to: KB1. The calculations required for different kind of Electrotechnical Calibration KB2. The various uncertainties of measurements related to Electrotechnical Calibration and how to report these KB3. Know about and understand how Electrotechnical Calibration is performed. KB4. Know about the sources of errors in the calibration process, how these are avoided and its impact on calibration accuracy. KB5. Familiar with: • Traceability of the calibration of instruments performing the tests • Types of Electrotechnical Devices, ranges and applications • Types of Calibration • Sources of inaccuracies in Electrotechnical measurements and how to avoid / minimize these • Deriving calibration results - data processing and interpretation • Mathematical and statistical equations involved in calculations
Skill(S)	
A. Core Skills / Generic Skills	**Writing skills**
	The individual on the job needs to know and understand how to: SA1. Use Formats and check list for Electrotechnical calibration calculations and reports SA2. Write emails and messages about calibration related issues
	Reading Skills

	The individual on the job needs to read and understand: SA3. Company policy related to Electrotechnical calibration SA4. Terminology, symbols, codes, standards, methods and common practices related to Electrotechnical Calibration SA5. Data processing steps, Uncertainty Calculations and reporting of results related to Electrotechnical calibration
	Oral Communication (Listening and Speaking skills)
	The individual on the job needs to know and understand how to: SA6. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA7. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**
	The individual on the job needs to know and understand how to: SB1. Make decisions about what calibration to perform and consult Supervisor if needed
	Plan and Organize
	The individual on the job needs to know and understand how to: SB2. Prioritize daily tasks and batches of calibration efficiently and effectively to meet client and company needs
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. R eal needs of the customer and suggest most appropriate solution SB4. Support customer when they need help
	Problem Solving
	The individual on the job needs to know and understand how to: SB5. Diagnose reasons for any down time in the calibration setup SB6. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB7. Use the existing information to arrive at actionable decision points SB8. Use the existing information for improving the customer satisfaction

IAS/N0520 Calculation of Electrotechnical Calibration Parameters

	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB9. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action



IAS/N0520 Calculation of Electrotechnical Calibration Parameters

NOS Version Control

NOS Code	IAS/N0520		
Credits (NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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IAS/N0204 **Reporting of Task Performed- Calibration**

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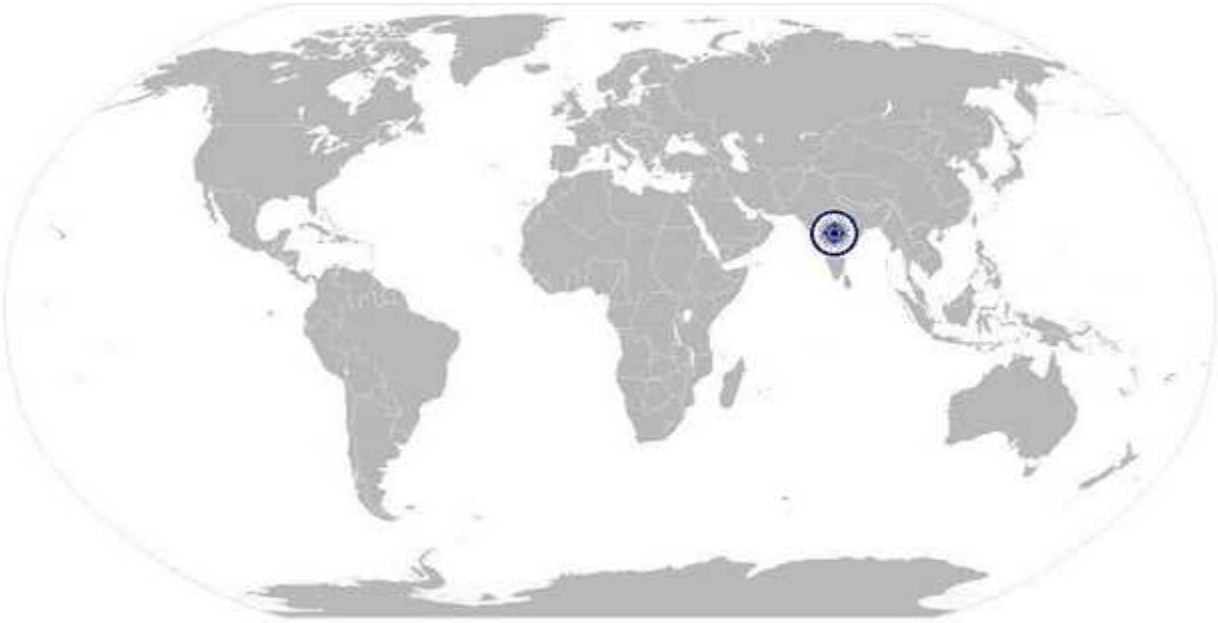
National Occupational Standard



Overview

This unit is about reporting and record keeping of calibration processes as per company processes.

IAS/N0204 **Reporting of Task Performed- Calibration**

National Occupational Standard

Unit Code	**IAS/N0204**
Unit title task	**Reporting of Task Performed-Calibration**
Description	The OS unit is about reporting and record keeping as per company processes and job description for Calibration Technician
Scope	This Unit Task covers performing the following: • Task Reporting - Normal • Task reporting - faults • Task reporting - PM • Task reporting – unusual occurrence • Task reporting - theft • Task reporting – security breach
Performance Criteria (PC) with respect to the scope:	
Element	**Performance Criteria**
Perform Task reporting- normal	PC1. Report completed task per organization process. • Record the completed task in log book or other document as defined by the SOP
Perform Task reporting- faults	PC2. Report faults/issues to immediate supervisor
Perform Task reporting - PM	PC3. Perform entry of preventive maintenance check lists/reports
Perform Task reporting-unusual occurrence	PC4. Report on noticing any visible changes in of Electrotechnical Calibration setup or its accessories. Report for immediate attention of supervisor
Perform Task reporting- theft	PC5. Report any theft in Electrotechnical Calibration setup to supervisor
Perform Task reporting-security breach	PC6. Report suspicious movement of new persons near of Electrotechnical Calibration setup to security and supervisor
Knowledge and Understanding (K)	
(A) Organizational context (Knowledge of the company organization and its process relevant to area of responsibilities)	KA1. How Electrotechnical Calibration is performed in the organization and the impact of it on the business.

IAS/N0204 Reporting of Task Performed- Calibration

(B) Technical Knowledge	The individual has the knowledge and understanding to be: KB1. Able to write daily log and failure reports KB2. Able to furnish basic data to supervisor related to specifications of Electrotechnical Calibration setup KB3. Able to send internal mails related to supervisor or co-workers KB4. Familiar with basic computer work to type simple reports and use of e-mail. Records Maintenance history
Skill(s)	
A. Core Skills / Generic Skills	**Writing skills**
	The individual on the job needs to know and understand how to: SA1. Use Formats and check list for calibration and reports SA2. Write emails and messages about calibration related issues
	Reading Skills
	The individual on the job needs to read and understand: SA3. Company policy related to calibration and reporting SA4. Formats and check list for Calibration SA5. Terminology, symbols, codes, standards and common practices related to sensors that are calibrated SA6. Terminology, data processing steps and reporting process
	Oral Communication (Listening and Speaking skills)
	The individual on the job needs to know and understand how to: SA7. Communicate issue / fault with complete details to the supervisor SA8. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting SA9. Communicate to the management in meetings about process or equipment issues which need management attention
B. Professional Skills	**Decision Making**
	The individual on the job needs to know and understand: SB1. What data is to be recorded SB2. What reports are to be made
	Plan and Organize
	The individual on the job needs to know and understand how to: SB3. Prioritize and schedule reporting tasks

IAS/N0204 **Reporting of Task Performed- Calibration**

	SB4. Cooperates with his/her team and offers assistance on a regular basis SB5. Communicate with the Calibration Supervisor for task scheduling, task reporting and exception reporting
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. Real needs of the customer and suggest most appropriate solution
	Problem Solving
	The individual on the job needs to know and understand how to: SB7. Investigate reasons for any anomalous report and correct it
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB8. Use the existing information to arrive at actionable decision points
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB10. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action SB11. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

IAS/N0204 **Reporting of Task Performed- Calibration**

NOS Version Control

NOS Code	IAS/N0204		
Credits(NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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IAS/N0521 Performed Preventive Maintenance - Electrotechnical Calibration

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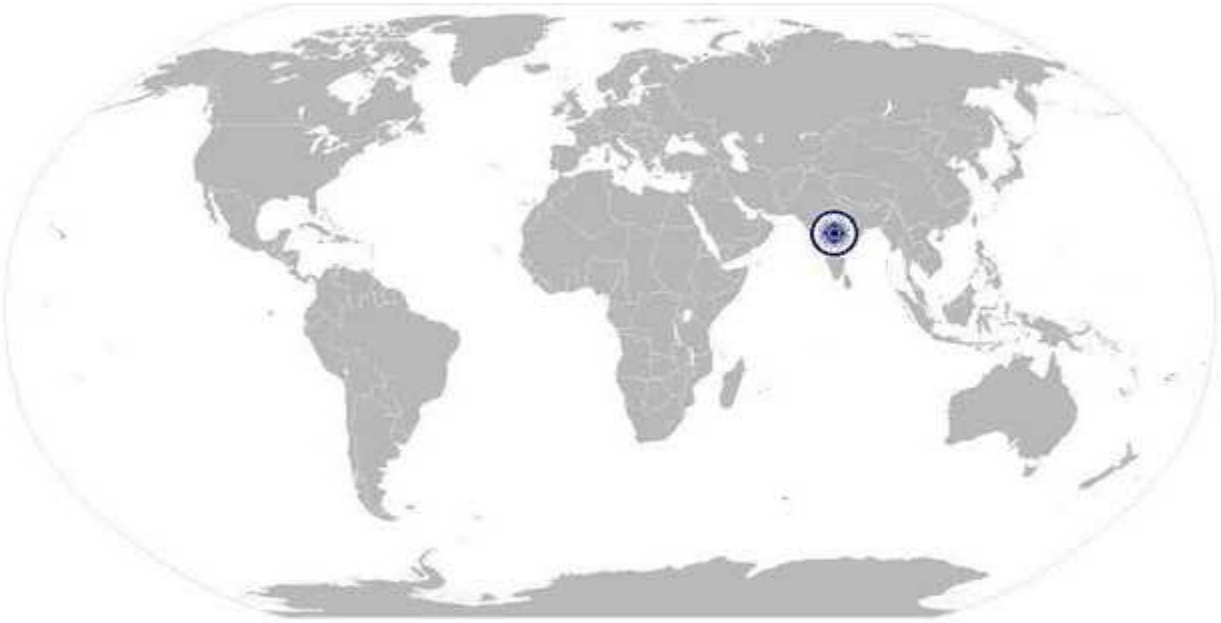
National Occupational Standard



Overview

The unit is about conducting regular Preventive Maintenance activities of Electrotechnical Calibration setup.

IAS/N0521 Performed Preventive Maintenance - Electrotechnical Calibration

National Occupational Standard

Unit Code	**IAS/N0521**
Unit title task	**Preventive Maintenance – Electrotechnical Calibration Setup**
Description	The OS unit is about performing Preventive maintenance for Electrotechnical Calibration setup.
Scope	This Unit Task covers the following : • PM- Visual checks and action • PM – completion of preventive maintenance schedule
Performance Criteria (PC) with respect to the scope:	
Element	**Performance Criteria**
Perform PM-Visual Checks and action	The individual on the job needs to be able to: PC1. Prepare PM list of devices and instruments. PC2. Carry out Visual Checks, using SOP of the organization for system health check and list observations and actions needed if any. PC3. Check for any damaged cable, broken plug/socket and leakage current in all electrical/electronic instruments. PC4. Check validity of calibration certificate for all Reference Instruments, Equipments and accessories PC5. Check calibration instruments, meters and accessories for proper operation over their range. PC6. Check all environmental parameters for compliance to SOP norms. This may require special tools and equipment, especially for checking stray magnetic field, EMI/EMC, Power Source Quality etc. • Consult SOP and Calibration Supervisor for guidance on how to measure the required parameters and whom to report issues.
Perform PM-completion of preventive maintenance schedule.	The individual on the job needs to be able to: PC7. For the listed items, perform corrective action following recommended procedure in the SOP. • **Do not tamper with any Reference Instrument or Device, or make any adjustments - this must be done by an authorized calibration agency, with due certification.** PC8. If the recommended maintenance does not restore the device to the required condition, add this to the Corrective Maintenance list and

	report. PC9. Complete preventive maintenance schedule list of Electrotechnical Calibration setup and accessories. Close any issues in the list.
Knowledge and Understanding	
A. Organizational context (Knowledge of the company organization and its process relevant to area of responsibilities)	Needs to know and understand : KA1. PM norms as defined by the company KA2. Production targets and production loss figures for the month and contribution of Electrotechnical Calibration towards it. KA3. Maintenance Policy of the company with respect to Electrotechnical Calibration strategy
B. Technical Knowledge	Needs to Know and understand: KB1. Trouble Shooting of Electrotechnical instruments KB2. Use of Calibration Manuals when required
Skill(s)	
A. Core Skills / Generic Skills	**Writing skills**
	The individual on the job needs to know how to: SA1. Use Formats and check list for Preventive Maintenance planning and reports SA2. Write emails and messages about maintenance related issues
	Reading Skills
	The individual on the job needs to know read and understand: SA3. Company policy related to Preventive Maintenance SA4. Down time in terms of production loss SA5. Formats for Preventive Maintenance check sheets
	Oral Communication (Listening and Speaking skills)
	The individual on the job needs to know and understand how to: SA6. Describe condition of control valves and accessories and issues to co-workers and supervisor SA7. Communicate to the management in meetings about maintenance issues which need management attention SA8. Interact with coworkers and gather information related to process and

	control valve conditions
B. Professional Skills	**Decision Making**
	The individual on the job needs to know and understand how to: SB1. Make decisions about timing and extent of preventive maintenance, in consultation with the Supervisor
	Plan and Organize
	The individual on the job needs to know and understand how to: SB2. Prioritize daily tasks to conduct Preventive Maintenance effectively
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. Understand real needs of the customer and suggest most appropriate solution
	Problem Solving
	The individual on the job needs to know and understand how to: SB4. Diagnoses reasons for down time due to calibration setup failure SB5. Identify immediate or temporary solutions to resolve delays and discuss with the Supervisor
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB6. Use the existing information to arrive at actionable decision points SB7. Use the existing information for improving the customer satisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB8. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action SB9. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

IAS/N0521 Performed Preventive Maintenance - Electrotechnical Calibration

NOS Version Control

NOS Code	IAS/N0521		
Credits(NSQF)	TBD	Version number	1.0
Sector	Instrumentation, Automation Surveillance and Communication	Drafted on	31/08/2017
Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing & Calibration	Next review date	31/08/2019

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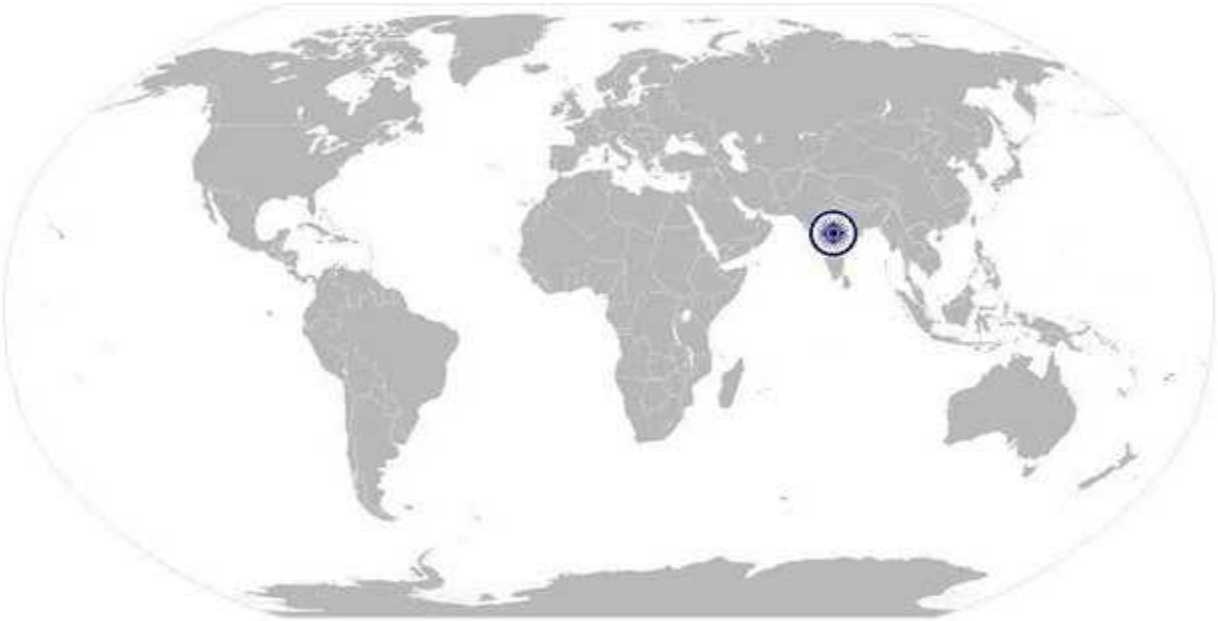
National Occupational Standard



Overview

This unit is about working effectively with colleagues, in own work group and in other work groups within the organization.

National Occupational Standard

Unit Code	IAS/N2105
Unit Title (Task)	**Work Effectively With Teams**
Description	This NOS unit is about building relationships and working with people and groups inside and outside the organization, using skills and habits, to achieve the team goals and objectives.
Scope	This unit/task covers the following: • Creating team environment • Communicating - giving and receiving • Working cooperatively • Participating in team decision making • Demonstrating Sense of Responsibility • Showing respect for opinions, customs and preferences
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Create Team Environment	To be competent, the individual on the job must be able to: PC1. Know and understand the team objectives and goals PC2. Know team members by name. Greet them appropriately and respond to their greetings. PC3. Know the roles and responsibilities of team members. Ensure others know about you and your role in the team PC4. Learn about the culture and preferences of team members – especially if they belong to other organizations or nationalities PC5. Follow organization's policies and procedures for working with team members within and outside the organization – especially relating to privacy, confidentiality and security. PC6. Create an environment of trust and mutual respect
Communicate – Give and Receive	To be competent, the individual on the job must be able to: PC7. Use appropriate mode of communication – verbal, written, mail, phone or text and clearly articulate your message to ensure that the recipient understands the message. PC8. Listen to team members and try to understand what they are wanting to say. Seek or provide clarifications if you see any gap in understanding PC9. Communicate professionally and follow organization protocols. Do not overload the team members with unnecessary and unsolicited information PC10. Share important information with the team timely. PC11. Respond to communications promptly.

IAS/N2105 **Work Effectively With Teams**

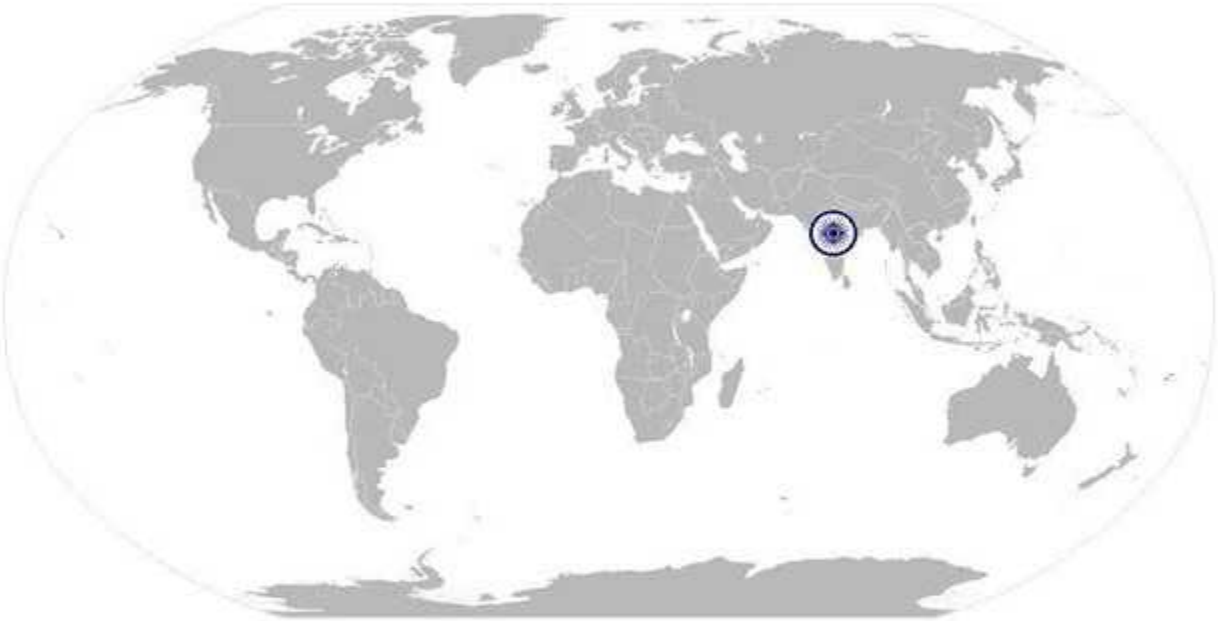
Work Cooperatively	To be competent, the individual on the job must be able to: PC12. Perform own role and produce output in time for other team members to consume PC13. Receive inputs from others and work upon it per role requirement PC14. Make adjustments within the permissible rules so that work flows smoothly. PC15. Help team members to perform their role effectively and provide any clarifications and support they need PC16. Share tools and common resources fairly, taking cognizance of others' needs and schedules PC17. Resolve any contentious issues amicably, involving the team lead or the supervisor if needed PC18. Let team members know in good time if you cannot carry out your commitments, explaining the reasons and alternate solutions, if any. Let the team lead know about this.
Participate in Team Decision making	To be competent, the individual on the job must be able to: PC19. Think positively and make constructive suggestions to meet the goals PC20. Accept and give suggestions with open mind PC21. Take initiatives and volunteer to contribute PC22. Help team members with facts and figures to arrive at workable decisions PC23. Accept decisions professionally and support these, even if these do not match your suggestions and personal views
Demonstrate Sense of Responsibility	To be competent, the individual on the job must be able to: PC24. Act in the interest of the team and the organization to ensure that things do not 'fall through the gap' and team goals are achieved. PC25. Take initiative to correct the situation if something seems to be going wrong. PC26. Seek help or escalate if the situation demands
Show Respect for Opinions, Customs and Preferences	To be competent, the individual on the job must be able to: PC27. Follow organization's and statutory guidelines about making references or comments to social customs or preferences PC28. Refrain from making any comments to hurt sentiments PC29. Accommodate team members' preferences to the extent feasible. If these come in the way of fulfilling team goals, discuss with the supervisor/ team leader. PC30. Seek information and clarifications from others if you do not understand any customs.
Knowledge and Understanding (K)	

A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. The organization's policies and procedures for working with colleagues, roles and responsibilities in relation to this KA2. The importance of effective communication and establishing good working relationships with colleagues KA3. Different methods of communication and the circumstances in which it is appropriate to use these KA4. The importance of creating an environment of trust and mutual respect KA5. The implications of own work on the work and schedule of others
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Different types of information that colleagues might need and the importance of providing this information when it is required KB2. The importance of helping colleagues with problems, in order to meet quality and time standards as a team
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job need to know and understand how to: SA1. Complete written work with attention to detail
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. Read instructions, guidelines/procedures
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA3. Listen effectively and orally communicate information SA4. Ask for clarification and advice from the concerned person
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. Make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
	Plan and Organize
	The user/individual on the job needs to know and understand: SB2. Plan and organize work to achieve targets and deadlines

	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. Real needs of the customer and suggest most appropriate solution SB4. Support customer when they need help
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. Apply problem solving approaches in different situations
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB6. Use the existing information to arrive at actionable decision points SB7. Use the existing information for improving the customer satisfaction SB8. Use the existing information to optimize solution and company business SB9. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB10. Apply balanced judgments to different situations

NOS Version Control

NOS Code	IAS/N2105		
Credits(NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	31/08/2017
Industry Sub-sector	Instrumentation	Last reviewed on	31/08/2017
Occupation	Testing and Calibration	Next review date	31/08/2019



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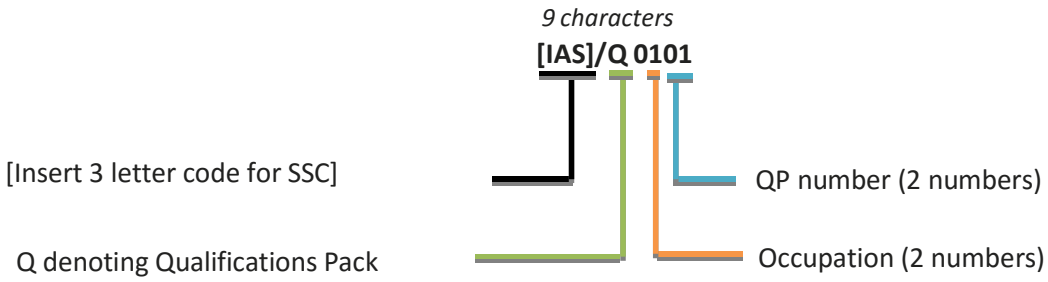
Annexure

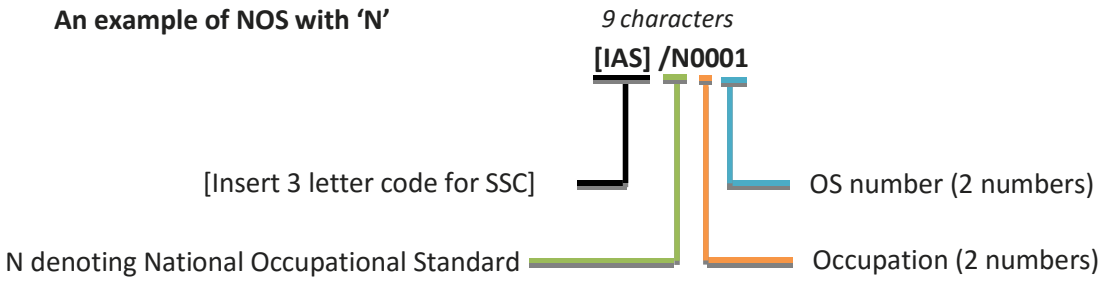
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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

Sub-sector	Range of Occupation numbers
Installation and Commissioning	**01-29**
Operation and Maintenance	**30-49**
Calibration	**50-55**
Design, Fabrication / Manufacturing	**56-79**
Design, Fabrication, Installation & Commissioning	**80-89**
General	**90-99**

Sequence	Description	Example
Three letters	Industry name	IAS
Slash	/	/
Next letter	Whether **Q**P or **N**OS	Q
Next two numbers	Occupation code	01
Next two numbers	OS number	01

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Qualifications Pack- Calibration Technician (Electrotechnical-1)

Qualification Pack IAS/Q5016

Sector Skill Council Instrumentation Automation Surveillance & Communication

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.

Relative Weight of NOSs in the Assessment			
Sl. No	**NOS no.**	**NOS Name**	**% Weightage**
1	IAS/N0511	Work Place Readiness - Electrotechnical Calibration	12
2	IAS/N0512	Calibration of AC/DC Voltage Sources Below 1GHz	12
3	IAS/N0513	Calibration of AC/DC Current Sources Below 1GHz	12
4	IAS/N0514	Calibration of R,L,C,Q Below 1GHz	12
5	IAS/N0522	Calibration of Temperature Simulators	12
6	IAS/N0520	Calculations for Electrotechnical Calibration	12
7	IAS/N0521	Preventive Maintenance of Electrotechnical Calibration Setup	12
8	IAS/N0204	Task Reporting-Calibration	8
9	IAS/N2105	Work Effectively with Teams	8
			100%

Assessment Outcomes	Assessment Criteria for Outcomes		Total Marks (150 +150 +150+ 150 + 150 +60+100+60+75)	Out of	Theory	Skills Practical
1. IAS/N0511 Work Place Readiness - Electrotechnical Calibration	PC1.	Perform Workplace Checks using prescribed by checklists and organizational norms and report any deviations.		3	1	2
	PC2.	Check for cleanliness of work area and equipment		3	1	2
	PC3.	Ensure an uncluttered workplace		3	1	2
	PC4.	Check / Feel for any abnormal vibrations generated by central air-conditioning plants, vehicular traffic and other sources.		3	1	2
	PC5.	If any vibration is felt which is unusual, then try to locate the source of vibration. Check if special/ protective devices like vibration free tables and pillars etc., isolating the equipment from the floor, are affected in any way.		3	1	2
	PC6.	Report any deviations and findings to the Supervisor and the concerned department.	**150**	3	1	2
	PC7.	If the vibration level is above specified limits, Calibration operation may be suspended. Refer to organization SOP for the quantitative measurement of vibration and relation guidelines.		3	1	2
	PC8.	Check / Listen for any abnormal noise in the calibration area. Refer to SOP for acceptable noise level - usually less than 60dBA.		3	1	2
	PC9.	If any noise is felt which is unusual, then try to locate the source of noise.		3	1	2
	PC10.	Report any deviations and findings to the Supervisor and the concerned department.		3	1	2
	PC11.	If the noise level affects the Calibration process, then the operation may be suspended. Refer to organization SOP for the quantitative measurement of noise and related guidelines.		3	1	2
	PC12.	Check for lighting / associated electricals at Electrotechnical Calibration Installation. Report any deviations to electrical		3	1	2
	PC13.	Check for adequate lighting and working of associated electrical fittings in the Calibration area. The recommended level of illumination is 250-500 Lux on the working table, or as specified in the SOP.		3	1	2
	PC14.	Check for temporary/unsafe electrical wiring		3	1	2

PC15.	Check for ambient temperature and humidity in the Calibration area. Refer to organization SOP for the quantitative measurement of temperature and humidity and the related guidelines.	3	1	2
PC16.	PC16. Report any deviations to the concerned department.	3	1	2
PC17.	If the environment parameters are likely to adversely affect the required accuracy of measurement, then report to the Supervisor and seek guidance about performing calibration.	3	1	2
PC18.	Ensure the norms specified in SOP are observed for intensity and location of magnetic field sources like, transformers, looped wires, ferrous materials etc. in order to minimize magnetic interference in the measurements, especially for magnetic measurements such as inductor, transformers etc.	10	5	5
PC19.	Ensure EMI/EMC norms are observed per SOP.	10	5	5
PC20.	Report any deviations to the concerned department.	3	1	2
PC21.	Ensure earthing norms per SOP for mains in accordance with relevant specification IS:3043. General standards are earth resistance to less than 1 ohm and earth to neutral voltage to less than 1 volt.	10	5	5
PC22.	Report any deviations to the concerned department.	3	1	2
PC23.	Ensure that the power supply of right quality (voltage, frequency, THD, transients, regulation etc.) as specified in SOP is available - usually from a UPS. Check that any isolation transformers and filters etc. installed are not tampered with and the hum interference is within limits.	10	5	5
PC24.	Ensure that operation of heavy loads in the premises or nearby locations does not cause any dip in voltage or transient currents.	10	5	5
PC25.	Report any deviations to the concerned department.	3	1	2
PC26.	Ensure that the laboratory is free from dust and external air pressure. Positive air pressure, is normally maintained inside the laboratory to avoid ingress of dust.	5	2	3
PC27.	Report any deviations to the concerned department.	3	1	2
PC28.	Ensure availability of suitable fire extinguishing equipment for possible fire hazards in the laboratory, per SOP.	3	1	2
PC29.	Ensure familiarity with method of giving the treatment in case of electric shock. Wall chart showing the procedure should be placed near the power supply switchgear and at other prominent places as prescribed under Indian Electricity Rules 1956.	5	2	3
PC30.	Report any deviations to the concerned department.	3	1	2

	PC31. Check for availability of instruments in the Electrotechnical Metrology calibration setup.		10	5	5
	PC32. Check availability of electrical power and the quality (whether UPS backed, voltage and frequency) as specified in the SOP		3	1	2
	PC33. Handle equipment in recommended and safe manner.		5	2	3
	PC34. Uses hand gloves of specified material for handling the UUC and Reference so that these are not soiled and to avoid heat transfer to Reference equipment or UUC during Calibration which may otherwise drastically affect the results.		3	1	2
		Total	**150**	**61**	**89**
2. IAS/N0512 Calibration of AC/DC Voltage Sources Below 1GHz	PC1. Note the method of calibration, as requested in the Job Order	**150**	3	1	2
	PC2. Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method		3	1	2
	PC3. Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.)		3	1	2
	PC4. Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean)		3	1	2
	PC5. Note all parameters to measure for the requested calibration (Voltage, Frequency, Phase, THD, Modulation, IMD etc.)		3	1	2
	PC6. Note all parameters ranges to calibrate		3	1	2
	PC7. Note the number of readings to be taken for each parameter		3	1	2
	PC8. Note the Reference Instruments and Components (i.e. divider etc.) to use for the parameters		5	2	3
	PC9. Wear gloves while handling instruments		3	1	2
	PC10. Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates)		10	5	5
	PC11. Verify that the measurement environment is appropriate for the reference instruments		5	2	3
	PC12. Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration		10	5	5
	PC13. Switch on the Reference equipment and the UUC		3	1	2
	PC14. Select appropriate functions, parameters and range for the Reference and the UUC		3	1	2

PC15.	If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP	10	5	5
PC16.	Record readings of ambient temperature and relative humidity using recommended devices	3	1	2
PC17.	Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP	3	1	2
PC18.	Select a parameter from the list of parameters to measure	3	1	2
PC19.	Measure the chosen parameter using the reference instrument and record the reading	5	2	3
PC20.	Measure the chosen parameter using the UUC and record the reading	5	2	3
PC21.	Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered.	5	2	3
PC22.	If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted by the software, provide appropriate response	3	1	2
PC23.	Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices	3	1	2
PC24.	Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed	3	1	2
PC25.	Use form/format specified in the SOP for performing calculations	3	1	2
PC26.	Perform the required calculations using calculator or software as specified	3	1	2
PC27.	Perform Type 'A' uncertainty calculations based on measurement data, per SOP	10	5	5
PC28.	Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty:	10	5	5
PC29.	Record the results, including uncertainty in the specified format	5	2	3
PC30.	Prepare Report in the format specified in the SOP	5	2	3
PC31.	Store and share report with the designated persons	3	1	2
PC32.	Return the Reference instruments and accessories to their recommended storage condition and position	3	1	2
PC33.	Return the UUC to its recommended storage condition	3	1	2
PC34.	Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done	2	1	1

			Total	**150**	**61**	**89**
3. IAS/N0513 Calibration of AC/DC Current Sources Below 1GHz	PC1.	Note the method of calibration, as requested in the Job Order	**150**	3	1	2
	PC2.	Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method		3	1	2
	PC3.	Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.)		3	1	2
	PC4.	Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean)		3	1	2
	PC5.	Note all parameters to measure for the requested calibration (Current, Frequency, Phase, THD, Modulation, IMD etc.)		3	1	2
	PC6.	Note all parameters ranges to calibrate		3	1	2
	PC7.	Note the number of readings to be taken for each parameter		3	1	2
	PC8.	Note the Reference Instruments and Components (i.e. shunt etc.) to use for the parameters		5	2	3
	PC9.	Wear gloves while handling instruments		3	1	2
	PC10.	Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates)		10	5	5
	PC11.	Verify that the measurement environment is appropriate for the reference instruments		5	2	3
	PC12.	Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration		10	5	5
	PC13.	Switch on the Reference equipment and the UUC		3	1	2
	PC14.	Select appropriate functions, parameters and range for the Reference and the UUC		3	1	2
	PC15.	If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP		10	5	5
	PC16.	Record readings of ambient temperature and relative humidity using recommended devices		3	1	2
	PC17.	Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP		3	1	2
	PC18.	Select a parameter from the list of parameters to measure		3	1	2
	PC19.	Measure the chosen parameter using the reference instrument and record the reading		5	2	3
	PC20.	Measure the chosen parameter using the UUC and record the reading		5	2	3

	PC21.	Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered.		5	2	3
	PC22.	If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate		3	1	2
	PC23.	Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices		3	1	2
	PC24.	Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed		3	1	2
	PC25.	Use form/format specified in the SOP for performing calculations		3	1	2
	PC26.	Perform the required calculations using calculator or software as specified		3	1	2
	PC27.	Perform Type 'A' uncertainty calculations based on measurement data, per SOP		10	5	5
	PC28.	Perform type 'B' components for uncertainty calculations per SOP.		10	5	5
	PC29.	Record the results, including uncertainty in the specified format		5	2	3
	PC30.	Prepare Report in the format specified in the SOP		5	2	3
	PC31.	Store and share report with the designated persons		3	1	2
	PC32.	Return the Reference instruments and accessories to their recommended storage condition and position		3	1	2
	PC33.	Return the UUC to its recommended storage condition		3	1	2
	PC34.	Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done		2	1	1
			Total	**150**	**61**	**89**
4. IAS/N0514 Calibration of R,L,C,Q Below 1GHz	PC1.	Note the method of calibration, as requested in the Job Order	**150**	3	1	2
	PC2.	Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method		3	1	2
	PC3.	Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial number, date, time, technician's name etc.)		3	1	2
	PC4.	Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean, no broken or loose terminals)		3	1	2
	PC5.	Note all parameters to measure for the requested calibration (Voltage, Current, Frequency, Phase angle, Loss Tangent, Leakage Current, and Hysteresis etc.)		3	1	2
	PC6.	Note all parameters ranges to calibrate		3	1	2

PC7.	Note the number of readings to be taken for each parameter		3	1	2
PC8.	Note the Reference Instruments and Components (i.e. divider etc.) to use for the parameters		5	2	3
PC9.	Wear gloves while handling instruments		3	1	2
PC10.	Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates)		10	5	5
PC11.	Verify that the measurement environment is appropriate for the reference instruments		5	2	3
PC12.	Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration		10	5	5
PC13.	Switch on the Reference equipment and the UUC		3	1	2
PC14.	Select appropriate functions, parameters and range for the Reference and the UUC		3	1	2
PC15.	If the measurements are automated, setup the recommended automation environment, enable the software and enter the required configuration parameters, per SOP		10	5	5
PC16.	Record readings of ambient temperature and relative humidity using recommended devices		3	1	2
PC17.	Allow the Reference equipment and the UUC to stabilize, as recommended y the manufacturer or SOP		3	1	2
PC18.	Select a parameter from the list of parameters to measure		3	1	2
PC19.	Measure the chosen parameter using the reference instrument and record the reading		5	2	3
PC20.	Measure the chosen parameter using the UUC and record the reading		5	2	3
PC21.	Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered.		5	2	3
PC22.	If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response		3	1	2
PC23.	Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices		3	1	2
PC24.	Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed		3	1	2
PC25.	Use form/format specified in the SOP for performing calculations		3	1	2

	PC26.	Perform the required calculations using calculator or software as specified		3	1	2
	PC27.	Perform Type 'A' uncertainty calculations based on measurement data, per SOP		10	5	5
	PC28.	Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty:		10	5	5
	PC29.	Record the results, including uncertainty in the specified format		5	2	3
	PC30.	Prepare Report in the format specified in the SOP		5	2	3
	PC31.	Store and share report with the designated persons		3	1	2
	PC32.	Return the Reference instruments and accessories to their recommended storage condition and position		3	1	2
	PC33.	Return the UUC to its recommended storage condition		3	1	2
	PC34.	Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done		2	1	1
			Total	**150**	**61**	**89**
5. IAS/N0522 Calibration of Temperature Simulators	PC1.	Note the method of calibration, as requested in the Job Order		3	1	2
	PC2.	Prepare Observation Sheet (use a standard form/format as specified in the SOP) appropriate for the method		3	1	2
	PC3.	Note in the Observation Sheet the details of the UUC (requesting company, lab reference number, type, make, model, serial		3	1	2
	PC4.	Verify that the UUC is in good shape (i.e. no physical damage, readable markings, clean, functional)		3	1	2
	PC5.	Note type(s) of Simulations to be calibrated (one or more Thermocouple types, one or more RTD types). The characteristics could be (mV vs Temperature Indication for Thermocouple simulator) or (Resistance vs Temperature Indication for RTD simulator).		3	1	2
	PC6.	Note all ranges to calibrate		3	1	2
	PC7.	Note the number of readings to be taken for each type and range		3	1	2
	PC8.	Note the Reference Instruments to use for the calibration (i.e. Digital Voltmeter, Resistance Meter - 4 wire etc.)		5	2	3
	PC9.	Wear gloves while handling instruments		3	1	2
	PC10.	Verify that the Reference Instruments are available and are in good shape (i.e. usable for calibration, have valid certificates)		10	5	5
	PC11.	Verify that the measurement environment is appropriate for the reference instruments		5	2	3

PC12.	Connect the Reference, the UUC and any other accessories according to recommended configuration according to the method of calibration. Ensure that the RTD calibration is done in 4-wire mode.		10	5	5
PC13.	Switch on the Reference equipment and the UUC		3	1	2
PC14.	Select appropriate functions, parameters and range for the Reference and the UUC		3	1	2
PC15.	If the measurements are automated, setup the recommended automation environment, enable the software and enter the		10	5	5
PC16.	Record readings of ambient temperature and relative humidity using recommended devices		3	1	2
PC17.	Allow the Reference equipment and the UUC to stabilize, as recommended by the manufacturer or SOP		3	1	2
PC18.	Select a parameter from the list of parameters to measure		3	1	2
PC19.	Measure the chosen parameter using the reference instrument and record the reading		5	2	3
PC20.	Measure the chosen parameter using the UUC and record the reading		5	2	3
PC21.	Repeat steps 19 and 20 for a number of times, as specified in the SOP and record all readings. Select the next parameter and repeat steps 18-20 till all parameters are covered.		5	2	3
PC22.	If the measurements are automated then ensure that the required steps and sequence is happening, which can be monitored on the HMI (computer display). If prompted y the software, provide appropriate response		3	1	2
PC23.	Record readings of ambient temperature and relative humidity at the end of measurements using recommended devices		3	1	2
PC24.	Refer to SOP and the appropriate NOS for the equations to use for the type of calibration being performed		3	1	2
PC25.	Use form/format specified in the SOP for performing calculations		3	1	2
PC26.	Perform the required calculations using calculator or software as		3	1	2
PC27.	Perform Type 'A' uncertainty calculations based on measurement data, per SOP		10	5	5
PC28.	Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty:		10	5	5
PC29.	Record the results, including uncertainty in the specified format		5	2	3
PC30.	Prepare Report in the format specified in the SOP		5	2	3

	PC31.	Store and share report with the designated persons		3	1	2
	PC32.	Return the Reference instruments and accessories to their recommended storage condition and position		3	1	2
	PC33.	Return the UUC to its recommended storage condition		3	1	2
	PC34.	Fix/Attach any recommended tag/markings on the UUC to signify that its calibration has been done		2	1	1
			Total	**150**	**61**	**89**
6. IAS/N0520 Calculations for Electrotechnical Calibration	PC1.	Perform Type 'A' uncertainty calculations based on the measurement data on the UUC, using the equations and procedures specified in the SOP		15	5	10
	PC2.	Perform type 'B' components for uncertainty calculations per SOP. The following Type B components are necessarily considered as a minimum for estimation of measurement uncertainty: a. U1: Uncertainty reported in the calibration certificate of the standard(s) / master(s) b. U2: Uncertainty arising from stability data of the measurement standard(s) / master(s) used for calibration c. U3: Uncertainty from the resolution of the Device/Unit under Calibration d. U4: Uncertainty due to accuracy of the Device/Unit under Calibration e. U5: Uncertainty due to other influential factors such as temperature, humidity variation etc affecting the measurements.	**60**	15	5	10
	PC3.	Calculate Measurement Uncertainty for the UUC type, following the procedures specified in the SOP		15	5	10
	PC4.	Prepare calibration report using the calculated data per format specified in SOP		5	2	3
	PC5.	Store the report in the prescribed device		5	2	3
	PC6.	Share the report with the designated persons		5	2	3
			Total	**60**	**21**	**39**
7. IAS/N 0204 Reporting of Task Performed Calibration	PC1.	Report completed task per organization process.		20	10	10
	PC2.	Report faults/issues to immediate supervisor		20	5	15
	PC3.	Perform entry of preventive maintenance check lists/reports		20	10	10
	PC4.	Report on noticing any visible changes in of Electrotechnical Calibration setup or its accessories.	**100**	20	5	15
	PC5.	Report any theft in Electrotechnical Calibration setup to supervisor		10	5	5

	PC6.	Report suspicious movement of new persons near of Electrotechnical Calibration setup to security and supervisor		10	5	5
			Total	**100**	**40**	**60**
8. IAS/N0521 Perform Preventive Maintenance of Electro-technical Calibration Setup	PC1.	Prepare PM list of devices and instruments.	**60**	5	2	3
	PC2.	Carry out Visual Checks, using SOP of the organization		5	2	3
	PC3.	Check for any damaged cable, broken plug/socket and leakage current in all electrical/electronic instruments.		5	2	3
	PC4.	Check validity of calibration certificate for all Reference Instruments, Equipments and accessories		5	2	3
	PC5.	Check calibration instruments, meters and accessories for proper operation over their range.		15	5	10
	PC6.	Check all environmental parameters for compliance to SOP norms. This may require special tools and equipment, especially for checking stray magnetic field, EMI/EMC, Power Source Quality etc.		15	5	10
	PC7.	For the listed items, perform corrective action following recommended procedure in the SOP.		5	2	3
	PC8.	If the recommended maintenance does not restore the device to the required condition, add this to the Corrective Maintenance list and report.		5	2	3
	PC9.	Complete preventive maintenance schedule list of Electrotechnical Calibration setup and accessories. Close any issues in the list.		5	2	3
			Total	**60**	**20**	**40**
9. IAS/N2105 Work Effectively With Teams	PC1.	Know and understand the team objectives and goals		3	1	2
	PC2.	Know team members by name. Greet them appropriately and respond to their greetings.		2	1	1
	PC3.	Know the roles and responsibilities of team members. Ensure others know about you and your role in the team		2	1	1
	PC4.	Learn about the culture and preferences of team members – especially if they belong to other organizations or nationalities		5	1	4
	PC5.	Follow organization's policies and procedures for working with team members within and outside the organization – especially relating to privacy, confidentiality and security.		2	1	1
	PC6.	Create an environment of trust and mutual respect		3	1	2

PC7.	Use appropriate mode of communication – verbal, written, mail, phone or text and clearly articulate your message to ensure that the recipient understands the message.		2	1	1
PC8.	Listen to team members and try to understand what they are wanting to say. Seek or provide clarifications if you see any gap in understanding		3	1	2
PC9.	Communicate professionally and follow organization protocols. Do not overload the team members with unnecessary and unsolicited information		4	1	3
PC10.	Share important information with the team timely.		3	1	2
PC11.	Respond to communications promptly.		3	1	2
PC12.	Perform own role and produce output in time for other team members to consume		3	1	2
PC13.	Receive inputs from others and work upon it per role requirement		2	1	1
PC14.	Make adjustments within the permissible rules so that work flows smoothly.		2	1	1
PC15.	Help team members to perform their role effectively and provide any clarifications and support they need		2	1	1
PC16.	Share tools and common resources fairly, taking cognizance of others' needs and schedules		2	1	1
PC17.	Resolve any contentious issues amicably, involving the team lead or the supervisor if needed	**75**	2	1	1
PC18.	Let team members know in good time if you cannot carry out your commitments, explaining the reasons and alternate solutions, if any. Let the team lead know about this.		2	1	1
PC19.	Think positively and make constructive suggestions to meet the goals		2	1	1
PC20.	Accept and give suggestions with open mind		2	1	1
PC21.	Take initiatives and volunteer to contribute		2	1	1
PC22.	Help team members with facts and figures to arrive at workable decisions		2	1	1
PC23.	Accept decisions professionally and support these, even if these do not match your suggestions and personal views		4	1	3
PC24.	Act in the interest of the team and the organization to ensure that things do not 'fall through the gap' and team goals are achieved.		4	1	3
PC25.	Take initiative to correct the situation if something seems to be going wrong.		2	1	1
PC26.	Seek help or escalate if the situation demands		2	1	1

PC27.	Follow organization's and statutory guidelines about making references or comments to social customs or preferences		2	1	1
PC28.	Refrain from making any comments to hurt sentiments		2	1	1
PC29.	Accommodate team members' preferences to the extent feasible. If these come in the way of fulfilling team goals, discuss with the supervisor/ team leader.		2	1	1
PC30.	Seek information and clarifications from others if you do not understand any customs.		2	1	1
		Total	**75**	**30**	**45**

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