

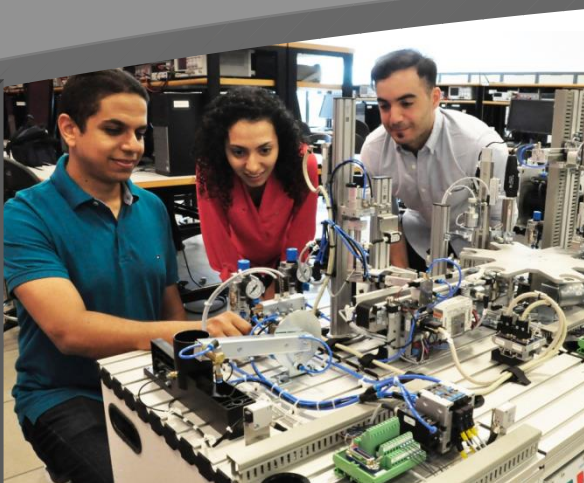
QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR INSTRUMENTATION AUTOMATION SURVEILLANCE AND COMMUNICATION INDUSTRY

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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Introduction

Qualifications Pack-Mechatronics Operator

SECTOR: INSTRUMENTATION AUTOMATION SURVEILLANCE & COMMUNICATION

SUB-SECTOR:Automation, Mechanical, Electrical, Electronics and Instrumentation

OCCUPATION:Operation and Maintenance

REFERENCE ID: IAS/Q3001

ALIGNED TO:NCO-2015/ NIL

Brief Job Description: The individual is responsible for operation of the complex system of Mechatronics efficiently. He also has to localize the malfunctions, identify causes and rectify them.

Personal Attributes:The individual must have complete knowledge of Mechatronics system which involves brief expertise in field of Mechanicals, Electricals, Electronics, Instrumentation and Automation. Individual should be able to document faults and contact or explain faults to expert individuals to prevent any production loss.

Job Details	Qualifications Pack Code	IAS/Q3001		
	Job Role	Mechatronics Operator		
	Credits (NSQF)	TBD	Version number	1.0
	Sector	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
	Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
	Occupation	Operation and Maintenance	Next review date	15/09/2019
	NSQC Clearance on*	DD/MM/YYYY		

* only after clearance from NSQC

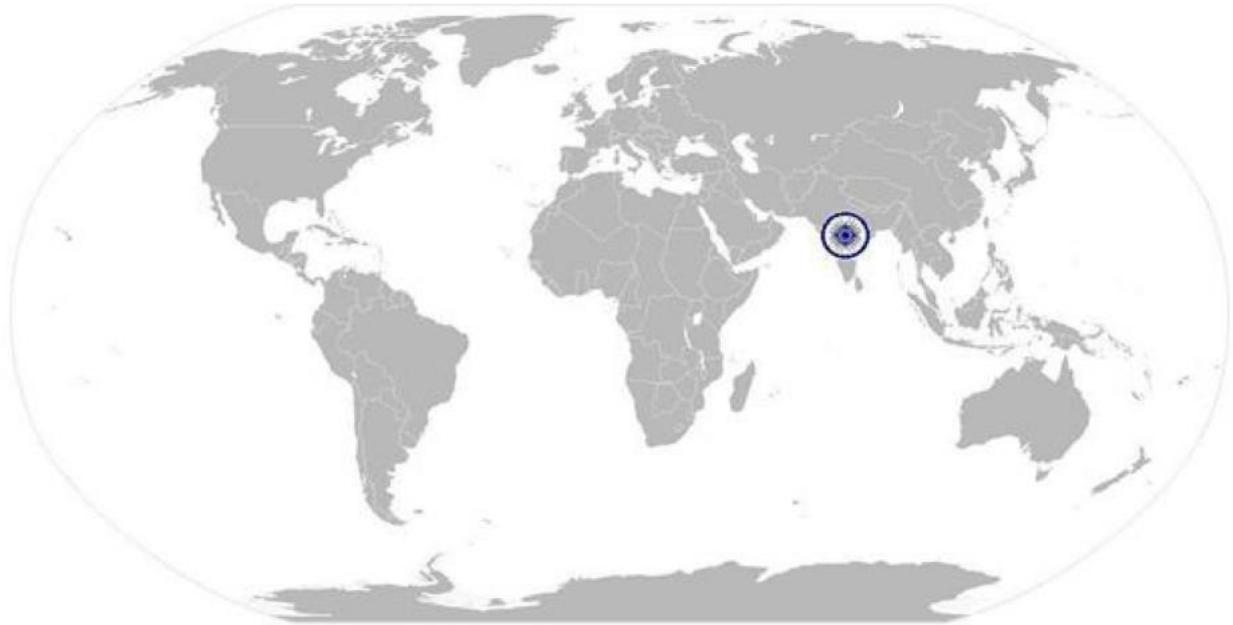
Job Role	Mechatronics Operator
Role Description	a. Efficient operation of the system b. Routine maintenance of the system
NSQF level	4
Minimum Educational Qualifications	Diploma in Mechanical/Electrical/Electronics/Instrumentation
Maximum Educational Qualifications	NA
Training	Training on Basics Mechatronics.
Minimum Job Entry Age	21 years.
Experience	Minimum 1 year Experience Individual should be under Expert assistance for one year
Applicable National Occupational Standards (NOS)	Compulsory: <ol style="list-style-type: none"> IAS/N3000 Function as a Machine Operator in a complex Mechatronics System IAS/N3001 Ensure efficient operation of equipment IAS/N3002 Ensure minimal down-times IAS/N3003 Understand and implement safety regulations IAS/N2005 Health and Safety in Workplace
Performance Criteria	As described in the relevant OS units

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation or an area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of OS.
Sub-function	Sub-function are sub-activities essential to fulfil in achieving the objectives of the function.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding	Knowledge and understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard.
Organizational Context	Organizational context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.

Acronyms

CoreSkills/Generic Skills	Core skills or generic skills are a group of skills that are the key to learning and working in today’s world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Keywords /Terms	Description
FAT	Factory Acceptance Test
PLC	Programmable Logic Controller
DCS	Distributed Control System
HMI	Human Machine Interface
SCADA	Supervisory Control And Data Acquisition
NOS	National Occupational Standard(s)
NVQF	National Vocational Qualifications Framework
NSQF	National Skill Qualifications Framework
NVEQF	National Vocational Education Qualifications Framework
QP	Qualifications Pack
ESD	Electro Static Discharge

National Occupational Standard



Overview

This OS unit is about understanding the functions of a Machine operator in a complex system of Mechatronics.

IAS/N3000

Function as a Machine Operator in a complex Mechatronics System

National Occupational Standard

Unit Code	IAS/N3000
Unit Title(Task)	Function as a Machine Operator in a complex Mechatronics System
Description	This unit is about to understand the function of a machine operator in a complex Mechatronics System.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • The mechatronic system functional layout • The control layout on the Operator Panel • The equipments used in the Operator Panel
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Understand the mechatronic system functional layout	To be competent, the user/individual on the job must be able to PC1. Identify the Sub-systems of complex mechatronic systems PC2. Examine how sub-systems work together PC3. Examine the Energy, Mass and Information flow within the mechatronic system PC4. Examine the usage of components pertaining to Mechanical, Pneumatic/Hydraulic, Electrical and PLC level. PC5. Complicated electrical, hydraulic and pneumatic drawings PC6. The operating procedure of mechatronic system with focus on number of steps involved in a particular machine cycle.
Understand the control layout on the Operator Panel	PC7. The power supply unit for powering the Mechatronic system Operator panel PC8. Examine the power supply wiring to the CPU in PLC and other components involved with the operator panel PC9. The Digital Input-Output module PC10. Examine the wiring of the Digital components on operator panel with IO modules PC11. The Analog Input-Output module PC12. Examine the wiring of the Analog components on operator panel with IO modules
Understand the equipments used in the Operator Panel	PC13. The variants of Input equipments like switches, push buttons, Limit switches etc. used in panel PC14. The variants of Output equipment like LED, lamps, hooters, exhaust fans etc. used in the panel PC15. The equipments like relays, contactors etc used in panel PC16. The terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc. PC17. The wiring diagrams between the PLC modules and the equipments/components used in panel
Knowledge & Understanding (K)	

IAS/N3000

Function as a Machine Operator in a complex Mechatronics System

<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. Company's code of conduct, organization culture and reporting structure</p> <p>KA2. Company's documentation policy</p> <p>KA3. Company's operation and production policy</p> <p>KA4. Quality and standards system followed in the company</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Mechanical, electrical, electronics and instrumentation</p> <p>KB2. Basics of machine safety and normal safety processes</p> <p>KB3. Quality, standards and guidelines to be followed during operation of the machine</p> <p>KB4. PLC module and equipments used in the Operator panel</p> <p>KB5. General arrangement drawing</p> <p>KB6. Safety aspects to be inbuilt in the operator panel system as per the requirement</p> <p>KB7. Instrumentation used in the factory and its wiring concept</p> <p>KB8. Operator panel and wiring knowledge</p> <p>KB9. Electronics indicators, switchgear and panel accessories</p> <p>KB10. IEC Standards</p> <p>KB11. Relevant regulations, standards and codes of practice and their implications on the operator panel</p> <p>KB12. Relevant documents and procedures used in the operation</p>
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. Compose E-mails, letters and other official documents clearly</p> <p>SA2. Write test reports</p> <p>SA3. Write schedules and timelines</p> <p>Reading Skills</p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA4. Read technical specifications and documentation</p> <p>SA5. Read standards and regulatory compliance documents</p> <p>SA6. Read schedules and timelines</p> <p>SA7. Read operating manuals</p> <p>Oral Communication (Listening and Speaking skills)</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA8. Discuss task lists, schedules and work-loads with co-workers</p> <p>SA9. Use simple and clear language when communicating with a co-workers</p> <p>SA10. Report issues and problems to managers in clear terms</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>

IAS/N3000

Function as a Machine Operator in a complex Mechatronics System

	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to readiness of the operator panel for supply SB3. Make decisions pertaining to operate the machine
	<p>Plan and Organise</p>
	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> SB4. Plan and organize machine operations SB5. Predict issues and have alternate strategy ready
	<p>Customer Centricity</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB6. Real needs of the customer and suggest most appropriate operating solution of the machine SB7. Support co-workers when they need help to benefit customer targets
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB8. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB9. Solve issues of co-workers lacking the technical background SB10. Identify and implement solutions to prevent production loss
	<p>Analytical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB11. Use the existing information to arrive at actionable decision points SB12. Use the existing information for improving the machine performance SB13. Analyze problems and identify causes and possible solutions
	<p>Critical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB14. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB15. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

IAS/N3000

Function as a Machine Operator in a complex Mechatronics System

NOS Code	IAS/N3000		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
Occupation	Operation and Maintenance	Next review date	15/09/2019

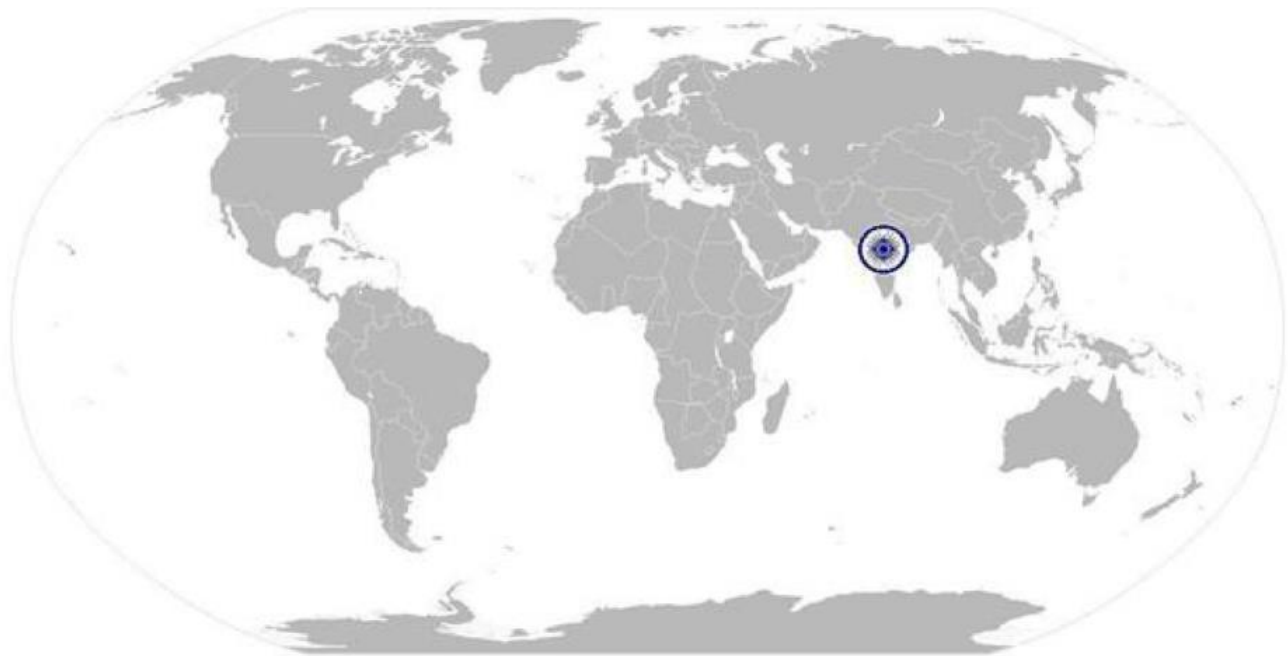


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IAS/N3001

Ensure efficient operation of equipment

National Occupational Standard



Overview

This OS unit is about ensuring efficient operation of the equipment.

IAS/N3001

Ensure efficient operation of equipment

National Occupational Standard

Unit Code	IAS/N3001
Unit Title(Task)	Ensure efficient operation of equipment
Description	This OS unit is about ensuring efficient operation of equipment.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> Recognize potential or impending malfunctions Contact expert assistance in order to keep the production line functioning
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Recognize potential or impending malfunctions	To be competent, the user/individual on the job must be able to PC1. Types of malfunctions possible within the mechatronic system PC2. Acquire basic knowledge on different types of physical signs for malfunction identification in mechanical, electrical, pneumatics/hydraulics systems PC3. Identify causes and sources of malfunctions where possible
Contact expert assistance in order to keep the production line functioning	PC4. Gather detailed reports on malfunctions PC5. Consult with experts for dealing with malfunctions PC6. Work effectively as a team-member and to coordinate their activities with upstream and downstream operations
Knowledge & 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. Company's code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Company's operation and production policy KA4. Quality and standards system followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Mechanical, electrical, electronics and instrumentation KB2. Basics of complex Mechatronics system operation KB3. Basics of machine safety and normal safety processes KB4. Quality, standards and guidelines to be followed during operation of the machine KB5. Control system module and equipments used in the Operator panel KB6. Application software, Installation and debugging aspects to be inbuilt in the PLC programming as per the process requirement KB7. Mechanical and instrumentation equipments healthy state KB8. Standards to be maintained for operation of machine KB9. Relevant documents to be referred for optimized functioning of machine
Skills (S)	

IAS/N3001

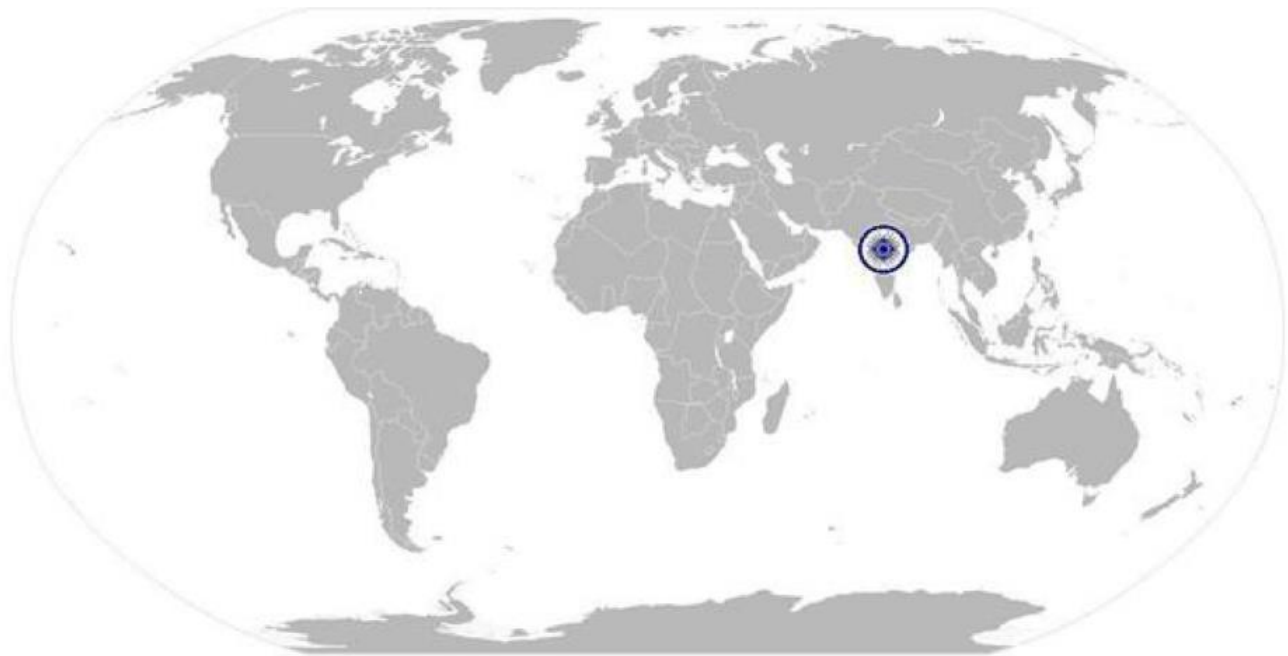
Ensure efficient operation of equipment

A. Core Skills/ Generic Skills	Writing Skills
	The user/ individual on the job needs to know and understand how to: SA1. Compose E-mails, letters and other official documents clearly SA2. Write test reports SA3. Write schedules and timelines
	Reading Skills
	The user/ individual on the job needs to know and understand how to: SA4. Read technical specifications SA5. Read standards and regulatory compliance documents SA6. Read schedules and timelines SA7. Read Standard operating procedures (SOP) manuals
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA8. Discuss task lists, schedules and work-loads with co-workers SA9. Use simple and clear language when communicating with a co-worker
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to operate machine for production SB3. Make decisions and steps to perform efficient operation of machine
	Plan and Organise
	The user/individual on the job needs to know and understand: SB4. Plan and organize machine operations SB5. Predict issues and have alternate strategy ready
	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 operating solution of the machine SB7. Support co-workers when they need help to benefit customer targets
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB8. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB9. Solve issues of co-workers, lacking the technical know how SB10. Identify and implement solutions to prevent production loss
	Analytical Thinking

IAS/N3001

Ensure efficient operation of equipment

	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. Use the existing information to arrive at actionable decision points</p> <p>SB12. Use the existing information for improving the machine performance</p> <p>SB13. Analyze problems and identify causes and possible solutions</p>
	<p>Critical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB14. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action</p> <p>SB15. Anticipate problems, risks and opportunities and utilize these for effective operation of machine</p>



NOS Version Control

IAS/N3001

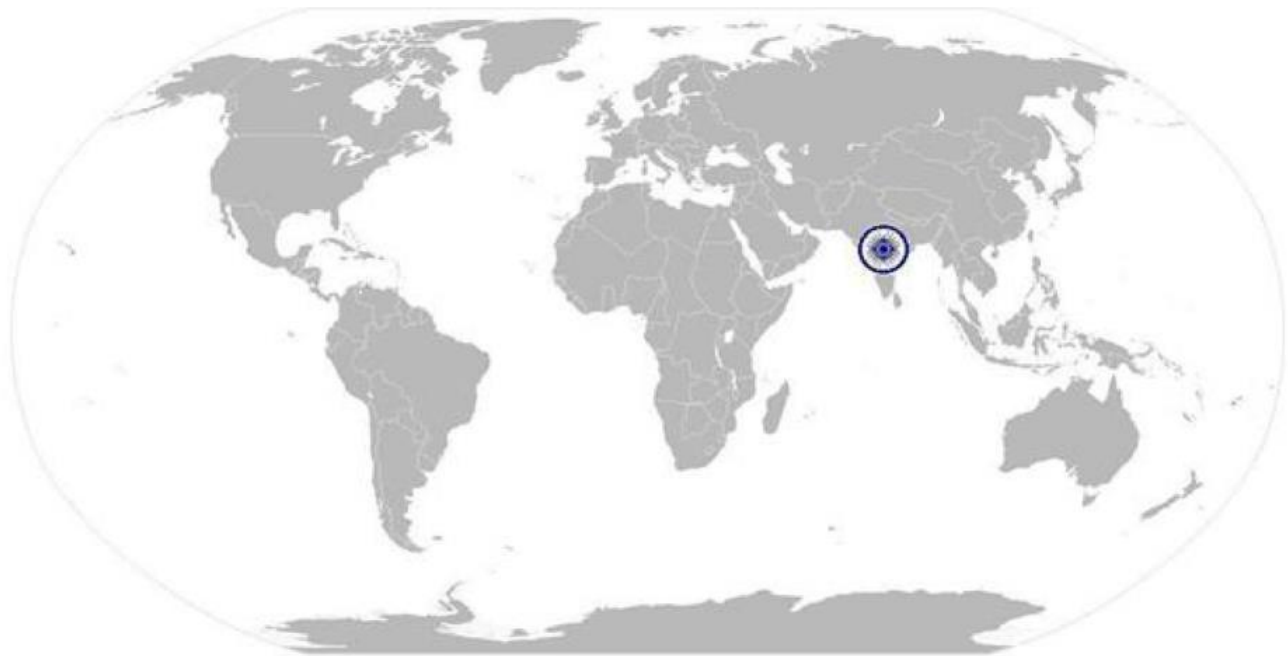
Ensure efficient operation of equipment

NOS Code	IAS/N3001		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
Occupation	Operation and Maintenance	Next review date	15/09/2019



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National Occupational Standard



Overview

This OS unit is about ensuring there is a minimal or no down-times in the operations of the machine.

IAS/N3002

Ensure minimal down-times

National Occupational Standard

Unit Code	IAS/N3002
Unit Title(Task)	Ensure minimal down-times
Description	This OS unit is about to ensuring there is a minimal or no down-times in the operation of the machine.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Conduct preventive/predictive maintenance (wherever appropriate) • Generate reports
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Conduct preventive/predictive maintenance (wherever appropriate)	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Interpret malfunction reports and outlines specific to the system PC2. Perform system troubleshooting tasks wherever possible PC3. Analyze the actual condition of equipment in system, rather than average or expected life statistics, to predict when maintenance will be required PC4. Continue with further checks to eliminate the sources of malfunctions
Generate reports	<ul style="list-style-type: none"> PC5. Create maintenance reports for regular malfunction monitoring PC6. Upgrade list of troubleshooting techniques required for regular maintenance activities PC7. Identify alternative techniques for minimizing down-time
Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. Company's reporting structure KA2. Company's documentation policy KA3. Company's operation and production targets KA4. Company's departments involved with troubleshooting
B. Technical Knowledge	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KB1. Mechanical, electrical, electronics and instrumentation KB2. Basics of Mechatronics operating systems KB3. Standard operating procedure (SOP) of the machine KB4. Control system module and equipments used in the operator panel KB5. Respective modules and equipments available in spare for replacement, if required KB6. General arrangement and electrical drawing KB7. Safety aspects to be inbuilt in the machine as per the requirement KB8. Testing process and parameters involved in the testing KB9. Standards to observe during down-times in a machine KB10. Relevant documents to be referred for maintenance of equipments in the complex system

IAS/N3002

Ensure minimal down-times

Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The user/individual on the job needs to know and understand how to: SA1. Compose E-mails, letters and other official documents clearly SA2. Write test reports SA3. Write schedules and timelines
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA4. Read technical specifications SA5. Read standards and regulatory compliance documents SA6. Read schedules and timelines SA7. Read operating manuals for regular maintenance
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA8. Discuss task lists, schedules and work-loads with co-workers SA9. Discuss with co-workers appropriately in order to understand the nature of the problem and make a diagnosis SA10. Report issues and problems to managers in clear terms
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to the appropriate solution to faults in machine SB3. Make decisions pertaining to replace faulty equipments and components from machine
	Plan and Organise
	The user/individual on the job needs to know and understand: SB4. Plan and organize regular shutdowns of machines for maintenance purpose SB5. Anticipate issues and have alternate strategy ready
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. Real needs of the customer and deliver most appropriate solution SB7. Support co-workers to solve issues to prevent customer loss
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB8. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB9. Solve problems of co-workers lacking the technical background SB10. Identify immediate or temporary solutions to resolve faults and

IAS/N3002

Ensure minimal down-times

	implement the proper solution immediately
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB11. Use the existing information to arrive at actionable decision points SB12. Use the existing information to optimize machine performance SB13. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB14. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB15. Anticipate problems, risks and opportunities and utilize these for higher machine performance

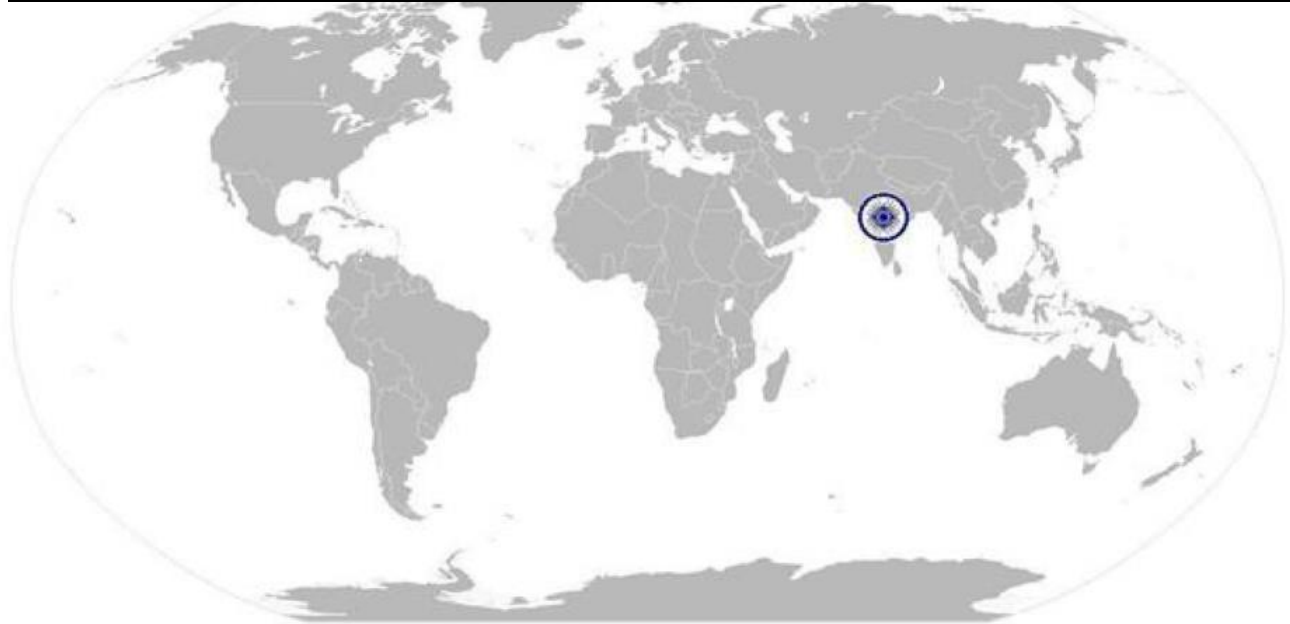


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IAS/N3002

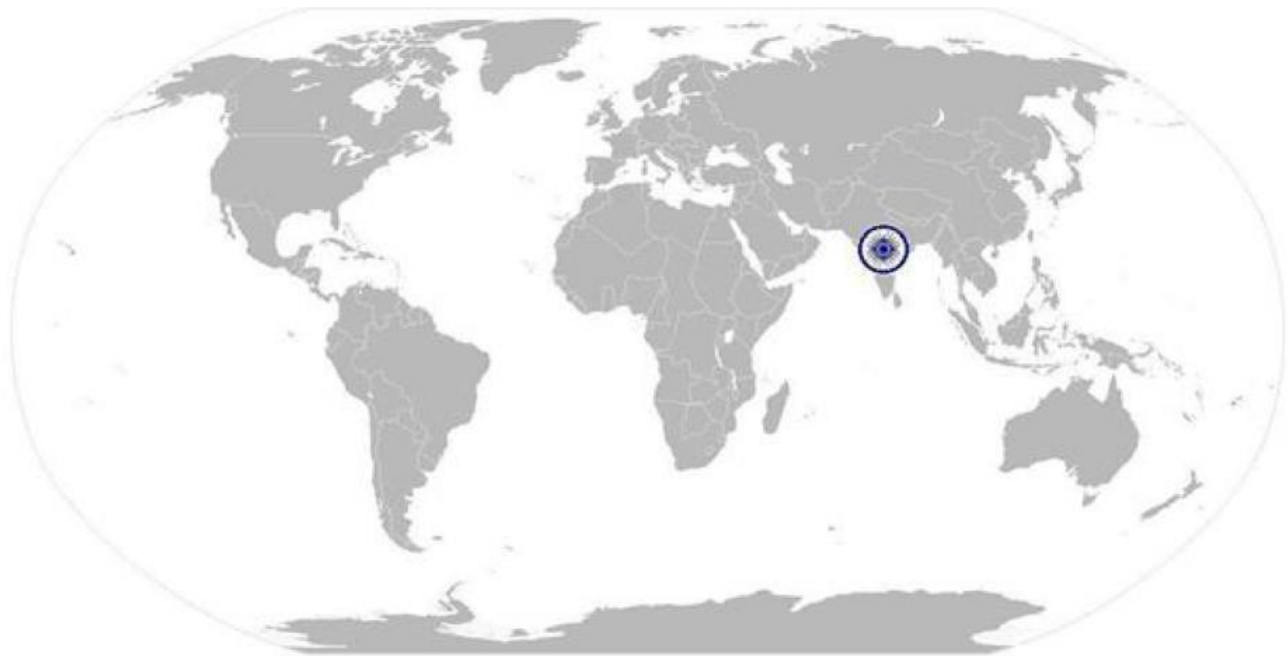
Ensure minimal down-times

NOS Code	IAS/N3002		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
Occupation	Operation and Maintenance	Next review date	15/09/2019



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National Occupational Standard



Overview

This OS unit is about understanding the safety regulations in the complex Mechatronics system and implementing them in the machine.

IAS/N3003

Understand and implement safety regulations

National Occupational Standard

Unit Code	IAS/N3003
Unit Title(Task)	Understand and implement safety regulations
Description	This OS unit is about to understand and implement the safety regulations in the machine.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Checking the safety functionality of sub-systems • Check for initial conditions mandatory for machine operation
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Checking the safety functionality of sub-systems	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Identify and understand safety regulations provided for sub-systems PC2. Check for safety features for efficient operation of systems PC3. Ensure proper working of safety features during run-time of mechatronic systems
Check for initial conditions mandatory for machine operation	<ul style="list-style-type: none"> PC4. Identify initial conditions for starting up machine PC5. Gather data on status of sensors and actuators for efficient machine operation PC6. Take measures if the initial conditions of the system are not satisfied
Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. Company's code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Departments involved with safety activities KA4. Quality and standards system followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: <ul style="list-style-type: none"> KB1. Mechanical, electrical, electronics and instrumentation KB2. Standard operating procedure (SOP) of the machine KB3. Basics of machine safety and normal safety processes KB4. Quality, standards and guidelines to be followed during operation of the machine KB5. Safety procedures to be followed during replacing module and equipments in a complex system KB6. Machine and wiring diagram KB7. Safety aspects to be inbuilt in the panel as per the requirement KB8. Safety aspects to be utilized while working with Instrumentation, electronic indicators, switchgear and accessories in machine KB9. Relevant regulations, standards and codes of practice for safety KB10. How to communicate with shop floor technicians in order to

IAS/N3003

Understand and implement safety regulations

	<p>educate them with safety norms</p> <p>KB11. Relevant documents and documentation for safety procedures used in the machine</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. Compose e mails, letters and other official documents clearly</p> <p>SA2. Write test reports</p> <p>SA3. Write schedules and timelines</p>
	Reading Skills
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA4. Read technical specifications</p> <p>SA5. Read standards and safety compliance documents</p> <p>SA6. Read schedules and timelines</p> <p>SA7. Read drawings</p>
	Oral Communication (Listening and Speaking skills)
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA8. Discuss task lists, schedules, and work-loads with co-workers</p> <p>SA9. Give clear directions to co-workers</p> <p>SA10. Use simple and clear language when communicating with a co-workers</p> <p>SA11. Report issues and problems to managers in clear terms</p>
	B. Professional Skills
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. Make decisions pertaining to the scope of work</p> <p>SB2. Make decisions to implement appropriate safety measures in machine/plant</p>	
Plan and Organise	
<p>The user/individual on the job needs to know and understand:</p> <p>SB3. Plan and organize safety trainings regularly</p> <p>SB4. Predict safety issues and have alternate safety strategy ready</p>	
Customer Centricity	
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB5. Support customer by guiding them in safety measures</p> <p>SB6. Inform customers about the safety to be taken during handling the machine</p>	
Problem Solving	
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB7. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p>	

IAS/N3003

Understand and implement safety regulations

	SB8. Solve problems of co-workers SB9. Identify immediate or temporary solutions to resolve delays and implement the proper solution when possible
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB10. Use the existing information to improve safety standards SB11. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB12. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB13. Anticipate problems, risks and opportunities and utilize these for preventing any safety issues

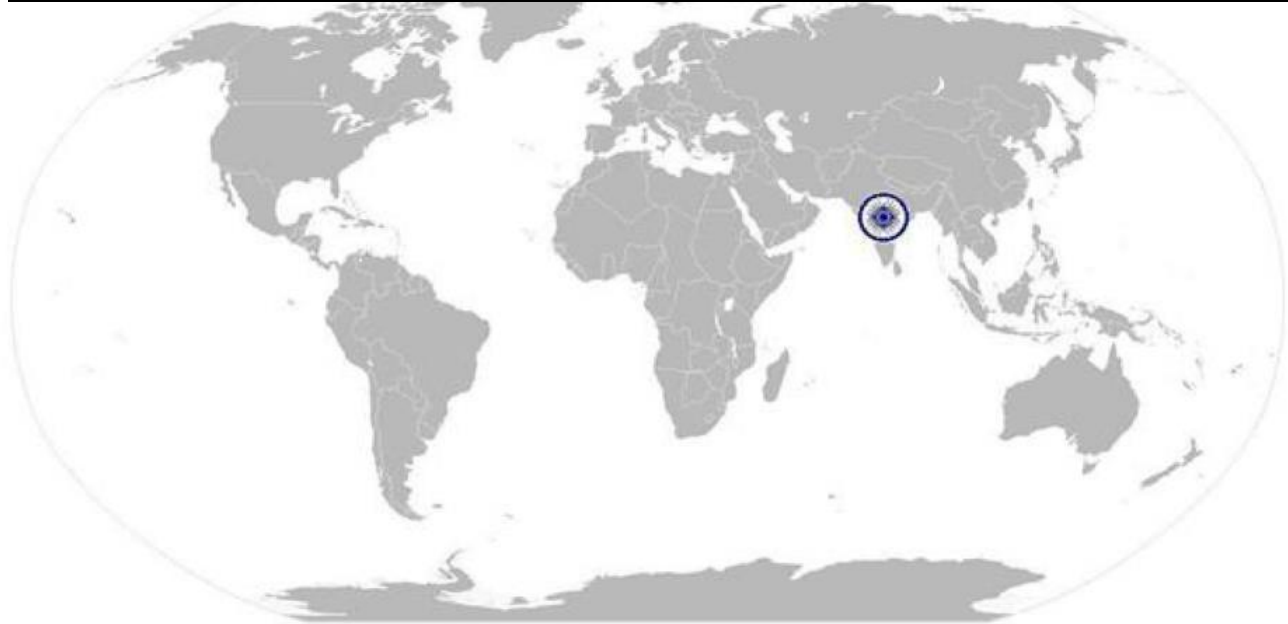


IAS/N3003

Understand and implement safety regulations

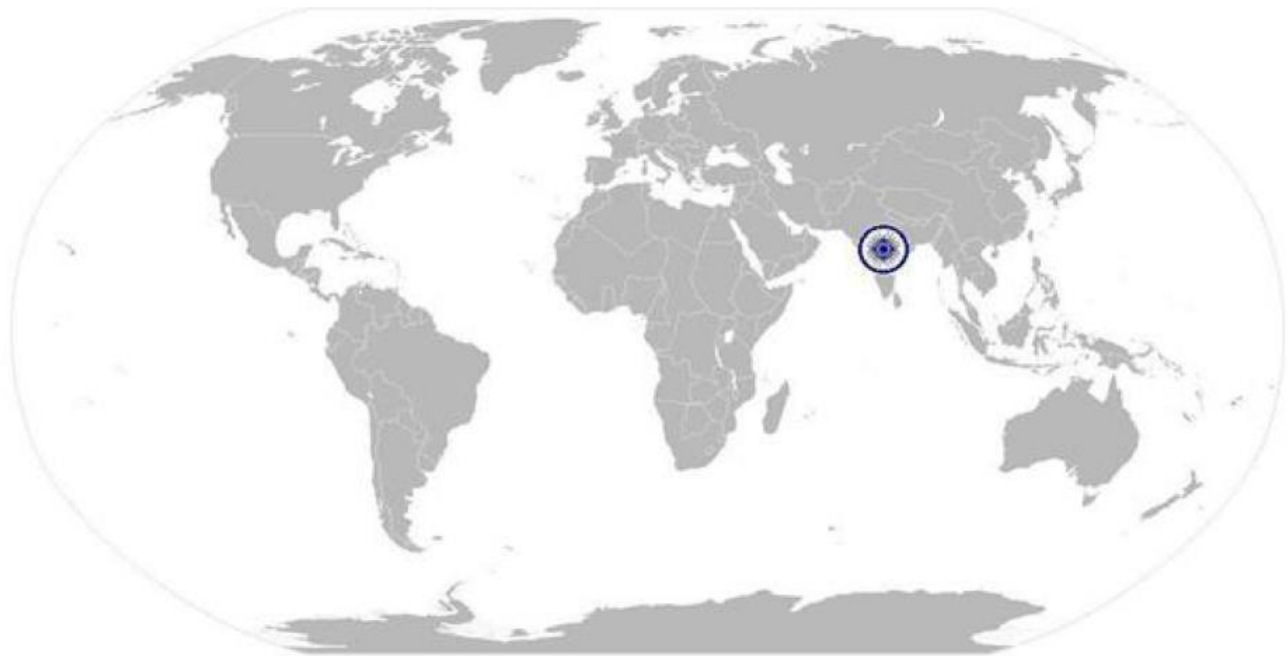
NOS Version Control

NOS Code	IAS/N3003		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
Occupation	Operation and Maintenance	Next review date	15/09/2019



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National Occupational Standard



Overview

This OS unit is about the individual's responsibility to maintain a safe, healthy and secure working environment.

IAS/N2005

Health and Safety in Workplace

National Occupational Standard	Unit Code	IAS/N2005
	Unit Title(Task)	Health and Safety in Workplace
	Description	This OS unit is about following adequate safety procedures to make work environment safe and healthy.
	Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Following safety measures and standards • Maintaining good health and posture
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Following safety measures and standards	To be competent, the user/ individual on the job must be able to: <ul style="list-style-type: none"> PC1. Comply with general and special safety procedures followed in the Company PC2. Follow specified safety procedures while handling an equipment, hazardous material or tool PC3. Remove ties, finger rings, or any other metal objects which may interfere with the work PC4. Use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc. PC5. Escalate about any hazardous materials or things found in the premises PC6. Report about any breach of safety procedure in the company PC7. Ensure zero accidents at work PC8. Avoid damage of components due to negligence in ESD procedures PC9. Regularly participate in fire drills or other safety related workshops organized by the company PC10. Ensure no loss for company due to safety negligence
	Maintaining good health and posture	<ul style="list-style-type: none"> PC11. Maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials PC12. Participate in company organized health sessions such as yoga, physiotherapy or games PC13. Handle heavy and hazardous materials with care and using appropriate tools and handling equipment such as trolleys, jacks and ladders
	Knowledge & Understanding (K)	
	A. Organizational Context (Knowledge of the company / organization and its processes)	The user/ individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. Company's policies on: incentives, delivery standards, and personnel management KA2. Company occupational safety and health policies KA3. Company emergency evacuation procedure KA4. Company's medical policy

IAS/N2005

Health and Safety in Workplace

B. Technical Knowledge	<p>The user/ individual on the job needs to know and understand:</p> <p>KB1. How to maintain the work area safe and secure</p> <p>KB2. How to handle hazardous materials, tools and equipment</p> <p>KB3. Emergency procedures to be followed such as fire accidents, electrocution etc.</p> <p>KB4. Long term value of good posture and use of appropriate handling equipment</p> <p>KB5. Safety regulations and standards and how to apply these</p> <p>KB6. Electrical grounding practices</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The user/ individual on the job needs to know and understand:</p> <p>SA1. Compose E-mails, letters, memos, reminders, and other documents clearly</p> <p>SA2. Share knowledge, issues, problems and resolutions relating to safety and health</p>
	Reading Skills
	<p>The user/individual on the job needs to know and understand:</p> <p>SA3. Read mails, messages, alerts</p> <p>SA4. Read pictures, drawings, notes relating to safety and health</p>
	Oral Communication (Listening and Speaking skills)
	<p>The user/ individual on the job needs to know and understand:</p> <p>SA5. Question co-workers in order to understand the safety and health issues</p> <p>SA6. Inform co-workers about safety and health issues</p> <p>SA7. Report issues and problems relating to safety and health to managers in clear terms</p>
B. Professional Skills	Decision Making
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. Make decisions pertaining to safety and health issues at workplace</p> <p>SB2. Make decisions about escalating safety and health issues at workplace to managers</p>
	Plan and Organise
	<p>The user/individual on the job needs to know and understand:</p> <p>SB3. Plan and organize work conforming to the safety and health norms of the company</p>
	Customer Centricity
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. Discuss customer needs with co-workers and identify most appropriate solution make customer happy and make them want</p>	

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Health and Safety in Workplace

	to work with the company
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. Discuss problems relating to the safety and health, evaluate the possible solution(s) and arrive at optimum /best possible solution(s)in consultation with concerned people
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB6. Discuss use the available information with co-workers to arrive at actionable decision points SB7. Analyze problems in team and identify causes and possible solutions
Critical Thinking	
The user/individual on the job needs to know and understand how to: SB8. Collaborate with co-workers to analyze, and evaluate the information gathered from collective observation, experience, reasoning, or communication, as a guide to teamwork	

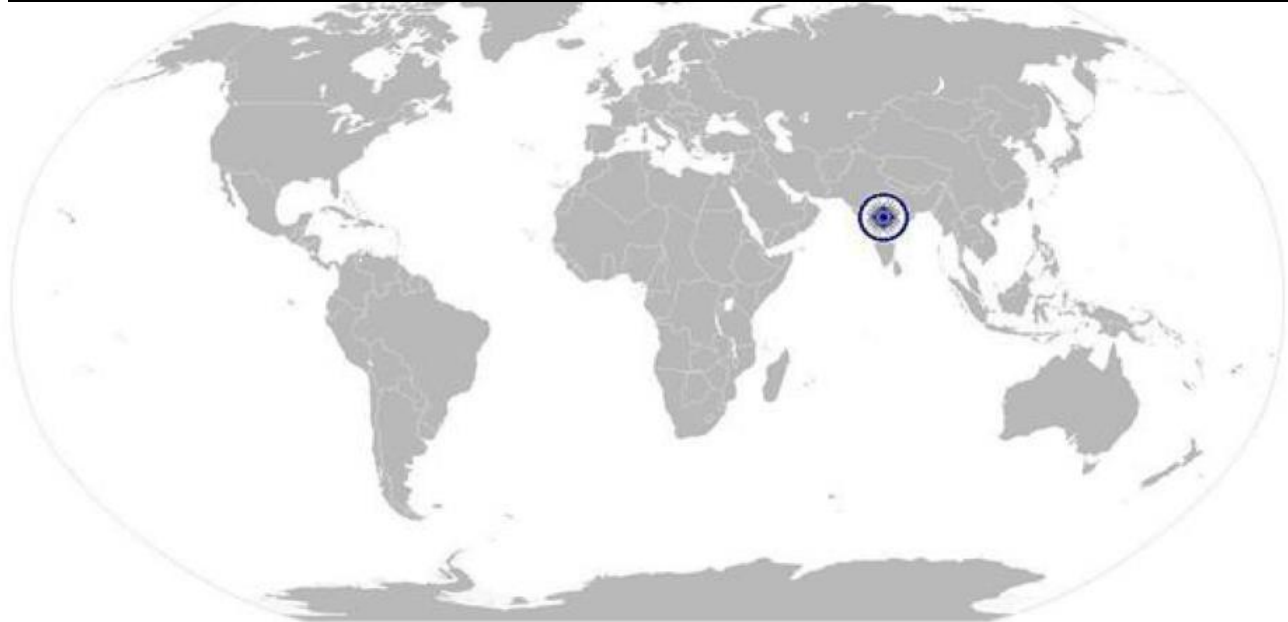


IAS/N2005

Health and Safety in Workplace

NOS Version Control

NOS Code	IAS/N2005		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation, Mechanical, Electrical, Electronics and Instrumentation	Last reviewed on	15/09/2017
Occupation	Operation and Maintenance	Next review date	15/09/2019

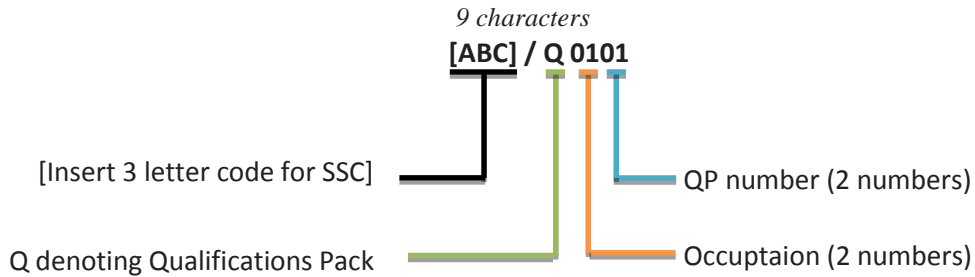


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Annexure

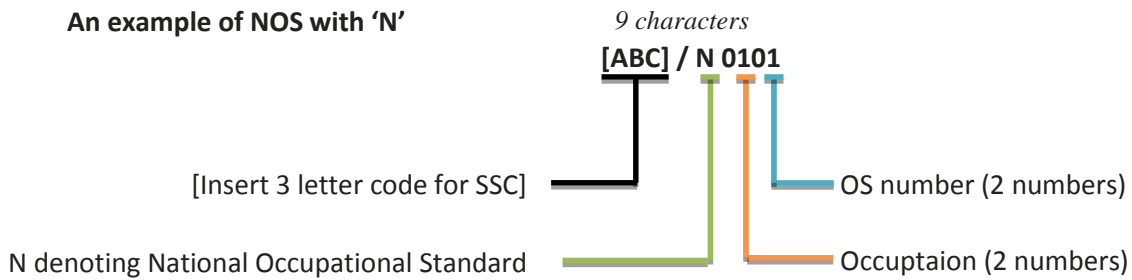
Nomenclature for QP and NOS

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 & Commissioning	01-29
Operation & 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	[ABC, Font: Calibri (Body), size 11]
Slash	/	/
Next letter	Whether QP or NOS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Mechatronics Operator

Qualification Pack IAS/Q3001

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 criteria.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Assessment outcomes	Assessment Criteria for outcomes	Marks Allocation			
		Total Mark (430)	Out Of	Theory	Skills Practical
1. IAS/N3000 Function as a Machine Operator in a complex Mechatronics System	PC1. Identify the Sub-systems of complex mechatronic systems	210	20	10	10
	PC2. Examine how sub-systems work together		10	5	5
	PC3. Examine the Energy, Mass and Information flow within the mechatronic system		20	10	10
	PC4. Examine the usage of components pertaining to Mechanical, Pneumatic/Hydraulic, Electrical and PLC level.		20	10	10
	PC5. Complicated electrical, hydraulic and pneumatic drawings		10	0	10
	PC6. The operating procedure of mechatronic system with focus on number of steps involved in a particular machine cycle		20	5	15
	PC7. The power supply unit for powering the Mechatronic system Operator panel		10	10	0
	PC8. Examine the power supply wiring to the CPU in PLC and other components involved with the operator panel		10	0	10

	PC9. The Digital Input-Output module		10	10	0
	PC10. Examine the wiring of the Digital components on operator panel with IO modules		10	0	10
	PC11. The Analog Input-Output module		10	10	0
	PC12. Examine the wiring of the Analog components on operator panel with IO modules		10	0	10
	PC13. The variants of Input equipments like switches, push buttons, Limit switches etc. used in panel		10	5	5
	PC14. The variants of Output equipment like LED, lamps, hooters, exhaust fans etc. used in the panel		10	5	5
	PC15. Understand the equipments like relays, contactors etc used in panel		10	5	5
	PC16. The terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc.		10	5	5
	PC17. The wiring diagrams between the PLC modules and the equipments/components used in panel		10	0	10
	Total		210	90	120
2.IAS/N3001 Ensure efficient operation of the equipment	PC1. Types of malfunctions possible within the mechatronic system	60	20	5	15
	PC2. Acquire basic knowledge on different types of physical signs for malfunction identification in mechanical, electrical, pneumatics/hydraulics systems		5	5	0
	PC3. Identify causes and sources of malfunctions where possible		10	5	5
	PC4. Gather detailed reports on malfunctions		5	5	0
	PC5. Consult with experts for dealing with malfunctions		10	5	5
	PC6. Work effectively as a team-member and to coordinate their activities with upstream and downstream operations		10	5	5
	Total		60	30	30
3.IAS/N3002 Ensure minimal down-times	PC1. Interpret malfunction reports and outlines specific to the system	60	10	10	0
	PC2. Perform system troubleshooting tasks wherever possible		10	0	10
	PC3. Analyze the actual condition of equipment in system, rather than average or expected life statistics, to predict when maintenance will be required		10	10	0

	PC4. Continue with further checks to eliminate the sources of malfunctions		10	0	10
	PC5. Create maintenance reports for regular malfunction monitoring		5	5	0
	PC6. Upgrade list of troubleshooting techniques required for regular maintenance activities		5	0	5
	PC7. Identify alternative techniques for minimizing down-time		10	5	5
		Total	60	30	30
4. IAS/N3003U Understand and implement safety regulations	PC1. Identify and understand safety regulations provided for sub-systems	30	5	5	0
	PC2. Check for safety features for efficient operation of systems		5	0	5
	PC3. Ensure proper working of safety features during run-time of mechatronic systems		5	0	5
	PC4. Identify initial conditions for starting up machine		5	0	5
	PC5. Gather data on status of sensors and actuators for efficient machine operation		5	5	0
	PC6. Take measures if the initial conditions of the system are not satisfied		5	0	5
		Total	30	10	20
5. IAS/N2005 Health and Safety in Workplace	PC1. Comply with general and special safety procedures followed in the Company	70	10	10	0
	PC2. Follow specified safety procedures while handling an equipment, hazardous material or tool		5	0	5
	PC3. Remove ties, finger rings, or any other metal objects which may interfere with the work		5	0	5
	PC4. Use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.		5	5	5
	PC5. Escalate about any hazardous materials or things found in the premises		5	5	0
	PC6. Report about any breach of safety procedure in the company		5	5	0
	PC7. Ensure zero accidents at work		5	5	0
	PC8. Avoid damage of components due to negligence in ESD procedures		5	0	5
	PC9. Regularly participate in fire drills or other safety related workshops organized by the company		5	0	5
	PC10. Ensure no loss for company due to safety negligence		5	5	0
	PC11. Maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials		5	0	5
	PC12. Participate in company organized health sessions such as yoga, physiotherapy or		5	0	5

	games			
	PC13. Handle heavy and hazardous materials with care and using appropriate tools and handling equipment such as trolleys, jacks and ladders	5	0	5
	Total	70	30	40

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