

QUALIFICATION 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

Qualification Pack-VFD Programmer & Troubleshooter

SECTOR: INSTRUMENTATION AUTOMATION SURVEILLANCE & COMMUNICATION

SUB-SECTOR: Automation

OCCUPATION: VFD Programming, Commissioning & troubleshooting

REFERENCE ID: IAS/Q8004

ALIGNED TO: NCO-2015/ NIL

VFD Programmer & Troubleshooter provides solution to Process Industry engineering and later troubleshoots any issues in Plant operations. VFD provides energy efficient solutions for precise motion and position control demanded by all types of industrial applications with adequate protection to the system

Brief Job Description: The individual is responsible for programming VFD used for the controlling various processes of Industries, finding and fixing errors or faults, if any, during the operation of the plant.

Personal Attributes: The individual must have knowledge of process manufacturing, field instrumentation, control system installation and expertise in the following project phases like documentation, detailed design generation, implementation, system integration, testing and onsite startup. Planning & coordination of project work within deadlines.

Job Details	Qualification Pack Code	IAS/Q8004		
	Job Role	VFD Programmer and Troubleshooter		
	Credits (NSQF)	TBD	Version number	1.0
	Sector	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
	Sub-sector	Automation	Last reviewed on	15/09/2017
	Occupation	VFD Programming, Commissioning & troubleshooting	Next review date	15/09/2019
	NSQC Clearance on*	DD/MM/YYYY		

* only after clearance from NSQC

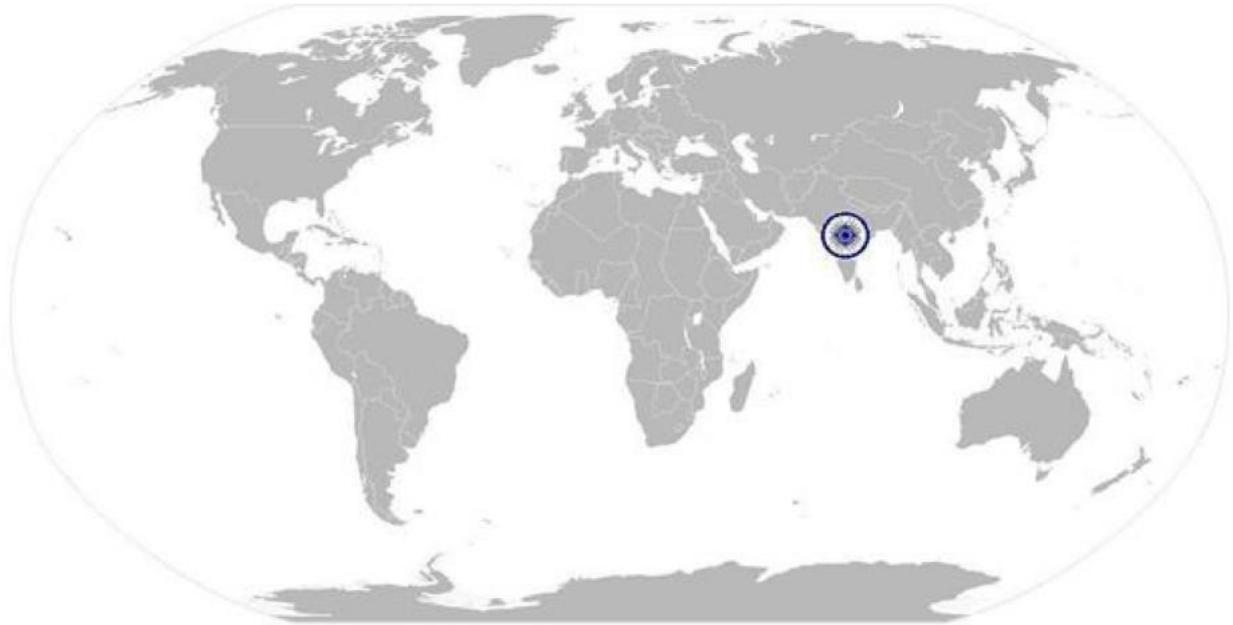
Job Role	VFD Programmer & Troubleshooter
Role Description	a. Programming of VFD system b. Commissioning of VFD system onsite c. Troubleshooting of VFD issues onsite
NSQF level	4
Minimum Educational Qualifications	Diploma in Electrical/Electronics B.Sc in Electrical/Electronics
Maximum Educational Qualifications	NA
Training (Suggested but not mandatory)	Training on Basics and Advance VFD
Minimum Job Entry Age	21 years
Experience	Minimum 1 year Experience Individual should assist Senior Engineer for commissioning and troubleshooting for six months Perform programming, commissioning and troubleshooting under supervision of Senior Engineer for six months
Applicable National Occupational Standards (NOS)	Compulsory: 1. IAS/N2300 Application know how and basic knowledge of VFD and Motor selection 2. IAS/N2301 Commissioning and testing of VFD using various tools onsite with motor 3. IAS/N2302 Diagnostics and Maintenance of VFD 4. IAS/N2005 Health and Safety in Workplace Optional: N.A.
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.
Qualification 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 qualification 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
VFD	Variable Frequency Drive
NOS	National Occupational Standard(s)
NVQF	National Vocational Qualifications Framework
NSQF	National Skill Qualifications Framework
NVEQF	National Vocational Education Qualifications Framework
QP	Qualification Pack
ESD	Electro Static Discharge

National Occupational Standard



Overview

This unit is about understanding the basics of Variable Frequency Drive and its related application. Also to understand the process of selection of Motor and VFD.

IAS/N2300

Application know how and basic knowledge of VFD and Motor Selection

National Occupational Standard	Unit Code	IAS/N2300
	Unit Title (Task)	Application know how and basic knowledge of VFD and Motor Selection
	Description	This unit is about to understand the PLC Control panel & PLC Modules / Equipments.
	Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Knowledge about the Site • Know how on Motor and VFD
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Knowledge about the Site	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Interact with customer and understand the application for which VFD is required PC2. Understand and examine the site location where the VFD panel will be mounted PC3. Avail technical write up of the application from customer PC4. Submit detail information to fabricator and technicians to prepare the VFD panel PC5. Interact with the customer for readiness of site PC6. Understand Motor HP(Horse Power) so that the corresponding VFD will be selected
	Know how on Motor and VFD	<ul style="list-style-type: none"> PC7. Interact and collect information from customer regarding the Motor specifications PC8. Collect selected motor's name plate data like speed, operating voltage, frequency, ampere ratings, motor type etc. PC9. Examine the information and select an appropriate VFD as per the Motor specifications and application PC10. Mount the VFD in the panel and perform preliminary tests
	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 installation and commissioning 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. Electrical, electronics and instrumentation KB2. Standard operating procedure (SOP) of the organization for VFD panel development process KB3. Basics of machine safety and normal safety processes KB4. Quality, standards and guidelines to be followed during panel design development 	

IAS/N2300

Application know how and basic knowledge of VFD and Motor Selection

	<p>KB5. Components and equipments used in the panel</p> <p>KB6. VFD programming software</p> <p>KB7. General wiring details of panel</p> <p>KB8. Electrical load calculations</p> <p>KB9. Basics on application and stages involved in the process</p> <p>KB10. Safety aspects to be inbuilt in the panel system</p> <p>KB11. Testing process and parameters involved in the VFD testing</p> <p>KB12. Electronics indicators, switchgear and panel accessories</p> <p>KB13. Sources and methods for obtaining required technical information for the panel being developed</p> <p>KB14. IEC Standards</p> <p>KB15. Relevant regulations, standards and codes of practice and their implications on the panel</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The 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 user requirements</p> <p>SA3. Write test reports</p> <p>SA4. Write schedules and timelines</p>
	Reading Skills
	<p>The individual on the job needs to know and understand how to:</p> <p>SA5. Read user requirements</p> <p>SA6. Read technical specifications and documentation</p> <p>SA7. Read standards and regulatory compliance documents</p> <p>SA8. Read schedules and timelines</p> <p>SA9. 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>SA10. Question customers appropriately in order to understand the application and the requirements</p> <p>SA11. Discuss task lists, schedules and work-loads with co-workers</p> <p>SA12. Keep customers informed about progress</p> <p>SA13. Use simple and clear language when communicating with a customer</p> <p>SA14. Report issues and problems 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 the scope of work</p> <p>SB2. Make decisions pertaining to readiness of the panel for supply</p> <p>SB3. Make decisions pertaining to readiness of customer site for panel installation</p>

IAS/N2300

Application know how and basic knowledge of VFD and Motor Selection

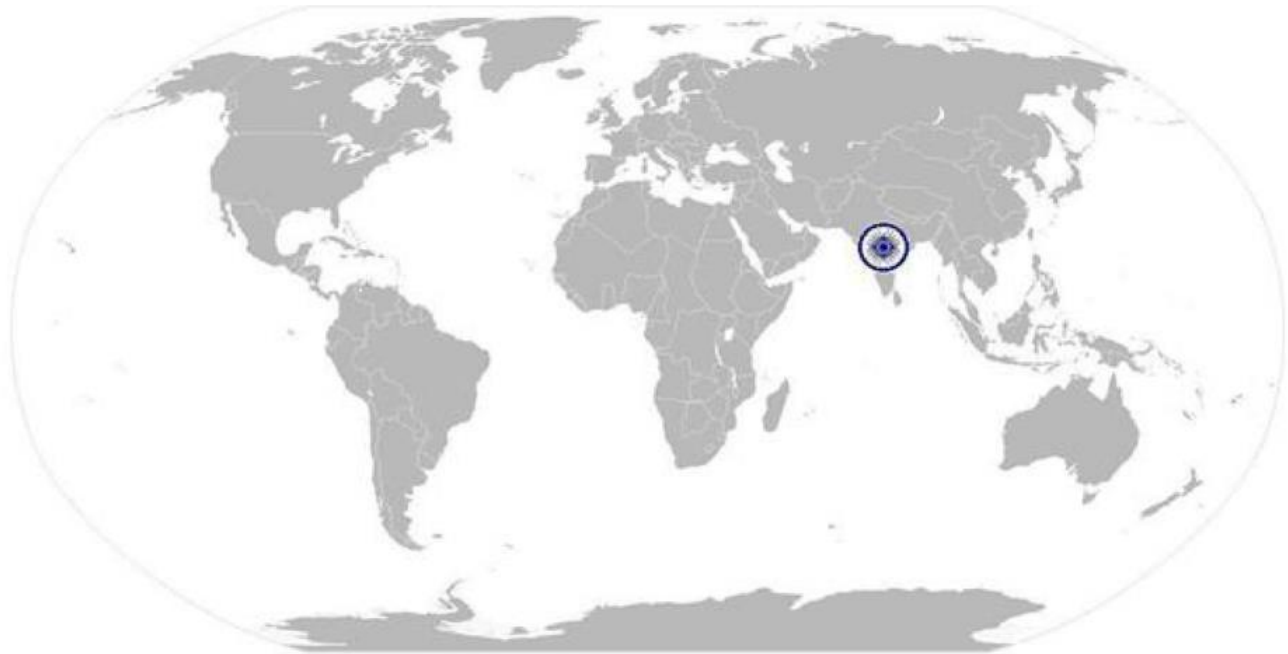
	SB4. Make decisions pertaining to changes in panel onsite
	Plan and Organise
	The user/individual on the job needs to know and understand: SB5. Plan and organize panel installation - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and feedback SB6. Anticipate issues and have alternate strategy
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB7. Understand real needs of the customer and suggest most appropriate solution SB8. Support customer when they need help SB9. Build customer relationships and rapport which promotes two way business
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB10. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB11. Solve issues of co-workers lacking the technical background SB12. Identify and implement solutions to resolve delays
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB13. Use the existing information to arrive at actionable decision points SB14. Use the existing information for improving the customer satisfaction SB15. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB16. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB17. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

IAS/N2300

Application know how and basic knowledge of VFD and Motor Selection

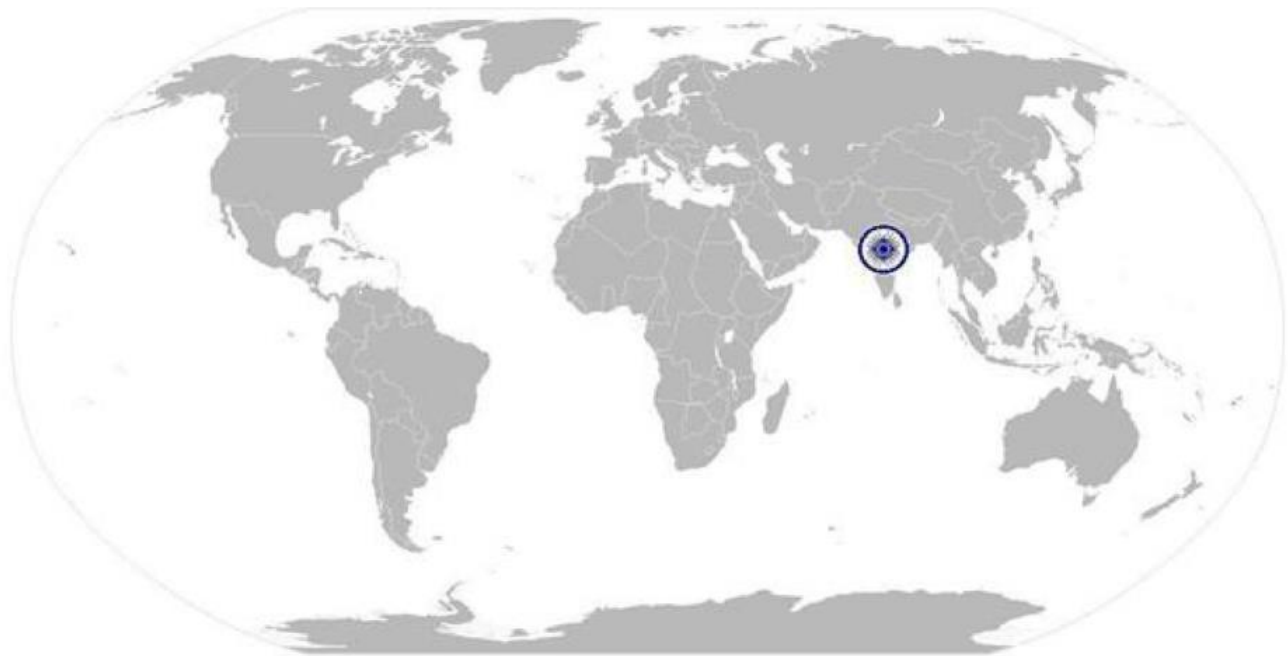
NOS Version Control

NOS Code	IAS/N2300		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	VFD Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about commissioning and testing of VFD using various tools onsite with Motor.

IAS/N2301

Commissioning and Testing of VFD using various tools onsite with Motor

National Occupational Standard	Unit Code	IAS/N2301
	Unit Title (Task)	Commissioning and Testing of VFD using various tools onsite with Motor
	Description	This unit is about commissioning and testing of VFD using various tools onsite with Motor.
	Scope	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Prerequisites before VFD commissioning • Understanding the Equipments used in the Control Panel • Detailing the VFD programming software & its pre-requisites • Knowledge on the available set of parameter and various libraries available in VFD • Downloading / transferring the parameter to the VFD in the control panel • Commissioning the program using trial runs for the process/application
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Prerequisites before VFD commissioning	<p>To be competent, the user/individual on the job must be able to</p> <p>PC1. Prior to power up a VFD a cold test is to be done to check the healthiness of VFD.</p> <p>PC2. Ensure proper connection of cables to the power terminals.</p> <p>PC3. Carry out a continuity test with the help of as per drawings.</p> <p>PC4. The VFD can be powered on after the above mentioned steps have been carried out successfully</p>
Understanding the Equipments used in the Control Panel	<p>PC5. Understand the wiring diagrams between the VFD and the equipments/components used in panel</p> <p>PC6. Understand the ferrule numbers used for the wiring in panel</p> <p>PC7. Understand the variants of Input equipments like switches, push buttons, Limit switches etc. used in panel</p> <p>PC8. Understand the variants of Output equipment like LED, lamps, exhaust fans etc. used in the panel</p> <p>PC9. Understand the equipments like relays, contactors etc used in panel</p> <p>PC10. Understand the terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc.</p>	
Detailing the VFD programming software & its pre-requisites	<p>PC11. Identify the Organization/Customer approved Software and use it for configuring the parameter.</p> <p>PC12. Collect information related to pre-requisites for software installation on PC/Laptops for programming</p> <p>PC13. Ensure the communication protocol to be used for communicating between programming software and VFD</p> <p>PC14. Check the availability of the communication port on PC/Laptop</p>	

IAS/N2301

Commissioning and Testing of VFD using various tools onsite with Motor

<p>Knowledge on the available set of parameter and various libraries available in VFD</p>	<p>PC15. As per motor the required set of basic parameter to be select. PC16. As per application the required set of function parameter to be select.</p>
<p>Downloading / transferring the parameter to the VFD in the control panel</p>	<p>PC17. Create a new project in offline PC18. Check the program with test bench if possible. PC19. Discuss and get permission from customer for downloading the parameters to VFD PC20. Transfer the parameter in the VFD Control unit PC21. Check the VFD program by activating sensors, switches or push buttons and examine the function of outputs</p>
<p>Commissioning the program using trial runs for the process/application</p>	<p>PC22. Inform customer about the preliminary check of IO's and gather information about availability of resources for trial runs PC23. Get permissions from customer for execution of process through VFD program PC24. Identify errors in program and redo the logic after customer suggestion and maintain the standards PC25. Ensure during trial runs error handling program works correctly to avoid sudden loss of productivity and attain a smooth shutdown if necessary PC26. Train the operators to educate them the sequence of operation in case of emergency PC27. Prepare a standard operating procedure (SOP) for the automation logic developed for the customer PC28. Collect the backup of the final VFD program and submit a copy to the plant head for future reference PC29. Sign a report (MOM) for correctly completing the installation & commissioning of the plant.</p>
<p>Knowledge & Understanding (K)</p>	
<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: KA1. Company's code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Departments involved with installation and commissioning 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: KB1. Electrical, electronics and instrumentation KB2. Basics of computer and operating systems KB3. Standard operating procedure (SOP) of the organization for Panel installation, commissioning and testing KB4. Basics of machine safety and normal safety processes KB5. Quality, standards and guidelines to be followed during program development</p>

IAS/N2301

Commissioning and Testing of VFD using various tools onsite with Motor

	<p>KB6. Components and equipments used in the panel</p> <p>KB7. VFD programming software</p> <p>KB8. Application software, Installation and debugging</p> <p>KB9. Basics on application and stages involved in the process</p> <p>KB10. Safety aspects to be inbuilt in the panel system</p> <p>KB11. Sources and methods for obtaining required technical information for the VFD program to be developed</p> <p>KB12. IEC Standards, parameters and testing process involved in VFD installation and testing</p> <p>KB13. Relevant documents to be referred for optimized VFD programming</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The 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 user requirements</p> <p>SA3. Write test reports</p> <p>SA4. Write schedules and timelines</p>
	Reading Skills
	<p>The individual on the job needs to know and understand how to:</p> <p>SA5. Read user requirements</p> <p>SA6. Read technical specifications</p> <p>SA7. Read standards and regulatory compliance documents</p> <p>SA8. Read schedules and timelines</p> <p>SA9. Read drawings</p>
	Oral Communication (Listening and Speaking skills)
B. Professional Skills	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA10. Question customers appropriately in order to understand the application and the requirements</p> <p>SA11. Discuss task lists, schedules, and work-loads with customers</p> <p>SA12. Keep customers informed about progress of commissioning</p> <p>SA13. Use simple and clear language when communicating with a customer</p>
	Decision Making
	<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 pertaining to use of relevant VFD programming software</p> <p>SB3. Make decisions pertaining to optimize VFD parameters</p>
Plan and Organise	

IAS/N2301

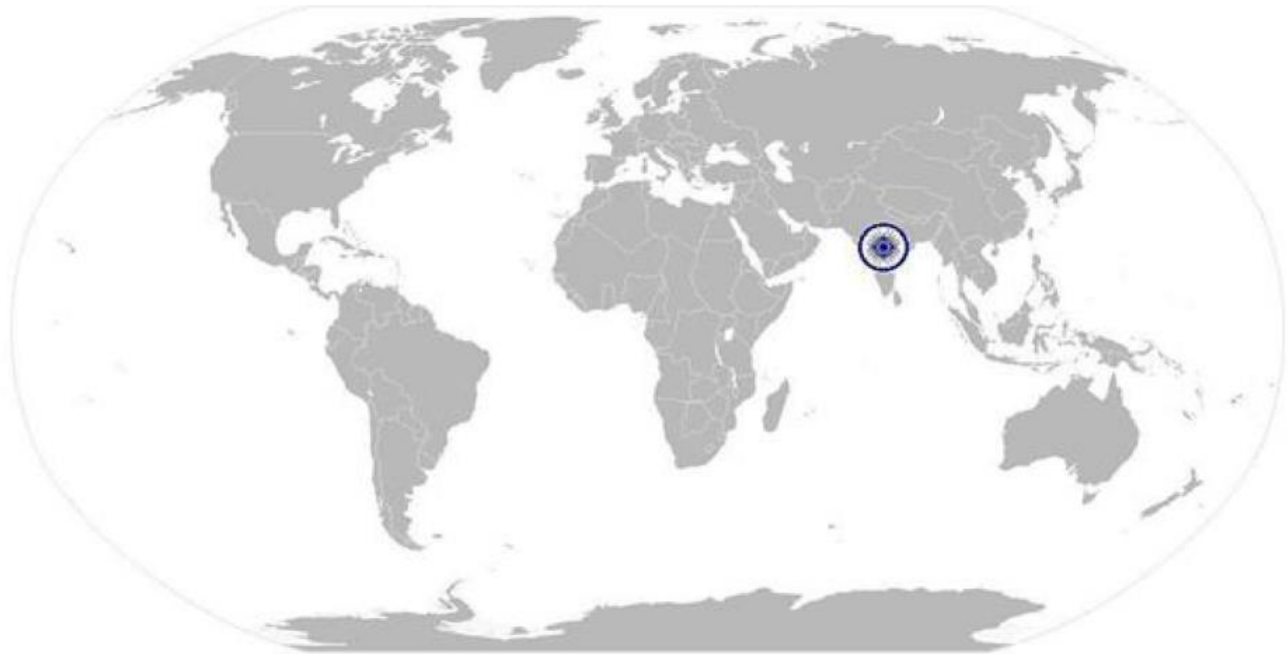
Commissioning and Testing of VFD using various tools onsite with Motor

	<p>The user/individual on the job needs to know and understand:</p> <p>SB4. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback</p> <p>SB5. Anticipate issues and have alternate strategy</p>
	<p>Customer Centricity</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB6. Understand real needs of the customer and suggest most appropriate solution</p> <p>SB7. Manage relationships and maintain good rapport with customers to get detail inputs on requirements</p>
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB8. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p> <p>SB9. Solve issues of co-workers, lacking the technical know how</p> <p>SB10. Identify immediate or temporary solutions to resolve delays</p>
	<p>Analytical Thinking</p>
	<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 to optimize parameters of VFD</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 installation and commissioning</p>	

IAS/N2301 Commissioning and Testing of VFD using various tools onsite with Motor

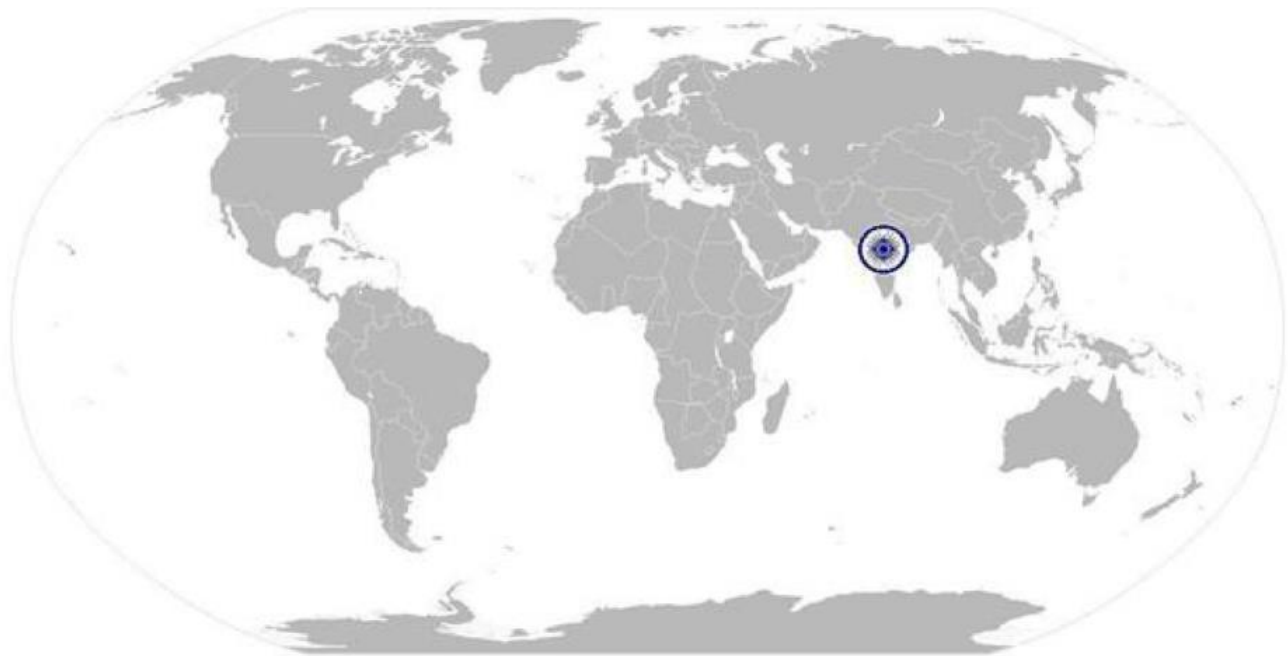
NOS Version Control

NOS Code	IAS/N2301		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	VFD Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about performing fault findings and maintenance of the VFD.

IAS/N2302

Diagnostics and Maintenance of VFD

National Occupational Standard

Unit Code	IAS/N2302
Unit Title (Task)	Diagnostics and Maintenance of VFD
Description	This unit is about to find the issues in the VFD and to perform maintenance of the VFD.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Understanding the problem in machine • Find out the cause of the fault by Software or operator panel • Resolve the issue and schedule tasks
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Understanding the problem in machine	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Collect the issues in the machine from the customer. PC2. Prepare document before using a VFD to rectify the problem PC3. Prepare a flow chart before troubleshooting any machine PC4. Check the control drawing of the machine/plant connected with the VFD. PC5. Check the availability of modules, equipment and electrical component on site. PC6. Refer the setting of instrument and installation guidelines. PC7. Providing the module replacement to the customer according to VFD. PC8. Check the availability of software and program backup.
Find out the cause of the fault by Software or operator panel	<ul style="list-style-type: none"> PC9. Before testing, Check main power is off. PC10. Check earthing and control supply. PC11. Check VFD module healthiness PC12. Make changes in running project if required to rectify the fault.
Resolve the issue and schedule tasks	<ul style="list-style-type: none"> PC13. At the time of troubleshooting check the connected devices are in operation or in stop. PC14. Change the parameter if problem coming is from software side PC15. Replace the module/equipment if it is found faulty. PC16. Take program backup before and after troubleshooting. PC17. Get the parameter reading according to schedule. PC18. Install, test and startup machine on site. PC19. Prepare a site report after troubleshooting and mention the remedy.
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 departments involved with engineering KA4. Quality and standards followed in the company

IAS/N2302

Diagnostics and Maintenance of VFD

<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Electrical, electronics and instrumentation</p> <p>KB2. Standard operating procedure (SOP) of the organization for VFD panel diagnostics and maintenance</p> <p>KB3. Component and equipment used in the panel</p> <p>KB4. Application software, Installation, testing and debugging</p> <p>KB5. General wiring details of the panel</p> <p>KB6. Basics on application and stages involved in the process</p> <p>KB7. Safety aspects to be inbuilt in the panel system</p> <p>KB8. Testing process and parameters involved in the testing</p> <p>KB9. Sources and methods for obtaining required technical information for the VFD to be tested</p> <p>KB10. IEC Standards to be followed in VFD maintenance</p> <p>KB11. Relevant documents to be referred for testing VFD</p>
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p> <p>The 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 individual on the job needs to know and understand how to:</p> <p>SA4. Read user requirements</p> <p>SA5. Read technical specifications</p> <p>SA6. Read schedules and timelines</p> <p>SA7. Read drawings</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. Keep co-workers informed about progress of debugging</p> <p>SA10. Discuss with co-workers appropriately in order to understand the nature of the problem and make a diagnosis</p> <p>SA11. Report issues and problems to managers in clear terms</p>
<p>B. Professional Skills</p>	<p>Decision Making</p> <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 pertaining to the appropriate solution to faults</p> <p>SB3. Make decisions pertaining to readiness of VFD for starting process</p> <p>SB4. Make decisions pertaining to installation of program onsite</p> <p>Plan and Organise</p>

IAS/N2302

Diagnostics and Maintenance of VFD

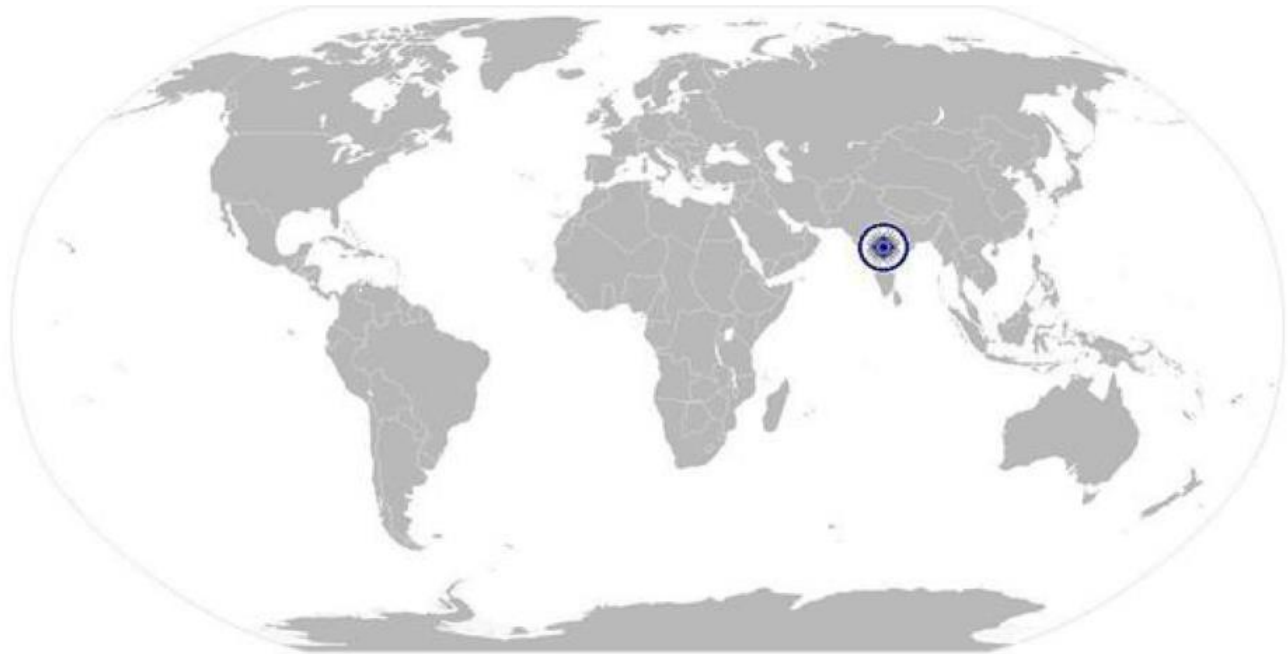
	<p>The user/individual on the job needs to know and understand:</p> <p>SB5. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback</p> <p>SB6. Anticipate issues and have alternate strategy</p>
	<p>Customer Centricity</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB7. Understand real needs of the customer and deliver most appropriate solution</p> <p>SB8. Build good relationships and rapport with customers which will help in inputs related to program diagnostics</p>
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB9. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p> <p>SB10. Solve problems of co-workers lacking the technical background</p> <p>SB11. Identify immediate or temporary solutions to resolve faults and implement the proper solution immediately</p>
	<p>Analytical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB12. Use the existing information to arrive at actionable decision points</p> <p>SB13. Use the existing information to optimize VFD parameters</p> <p>SB14. 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>SB15. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action</p> <p>SB16. Anticipate problems, risks and opportunities and use them to avoid performance loss</p>	

IAS/N2302

Diagnostics and Maintenance of VFD

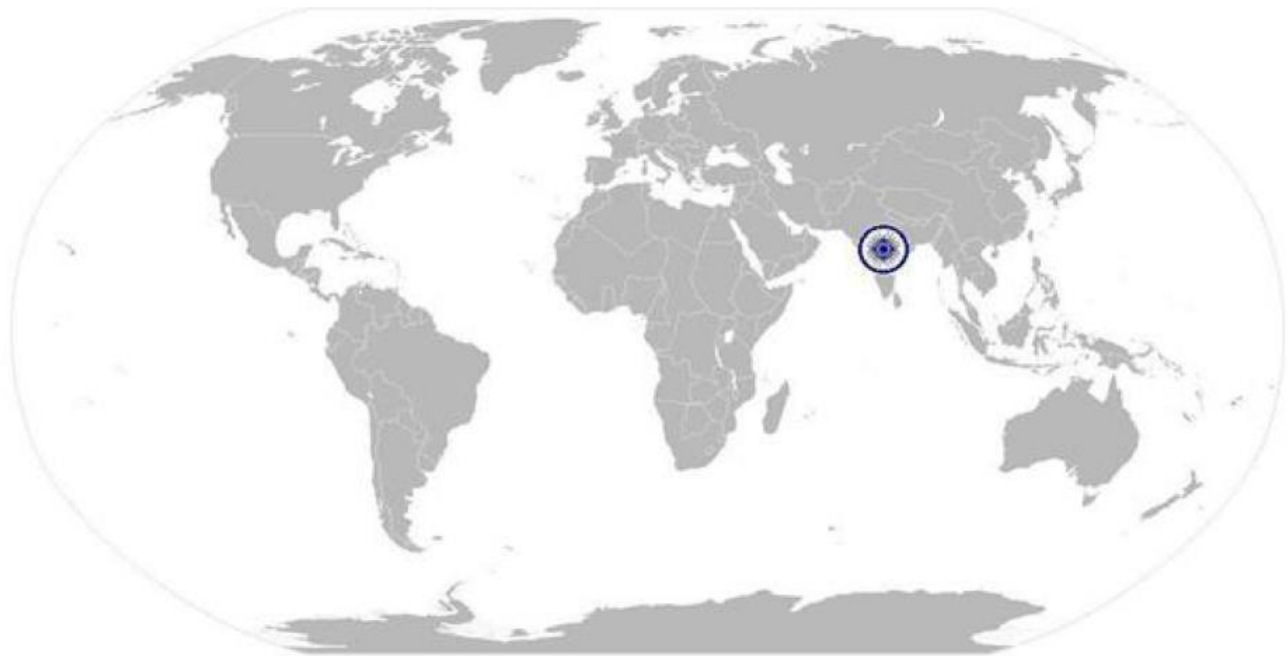
NOS Version Control

NOS Code	IAS/N2302		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	VFD Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This 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 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 individual 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 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

<p>B. Technical Knowledge</p>	<p>The 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>
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p> <p>The 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> <p>Reading Skills</p> <p>The 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> <p>Oral Communication (Listening and Speaking skills)</p> <p>The 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>
<p>B. Professional Skills</p>	<p>Decision Making</p> <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> <p>Plan and Organise</p> <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> <p>Customer Centricity</p> <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	

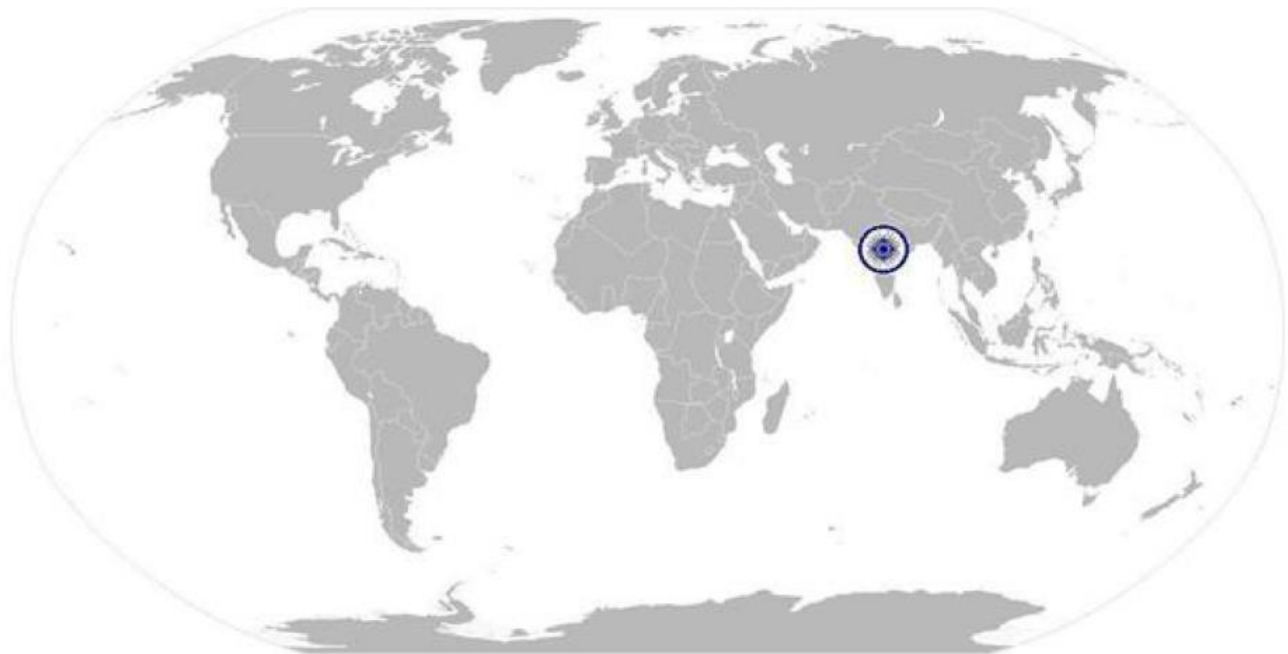


IAS/N2005

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	Last reviewed on	15/09/2017
Occupation	VFD Programming, Comissioning & troubleshooting	Next review date	15/09/2019

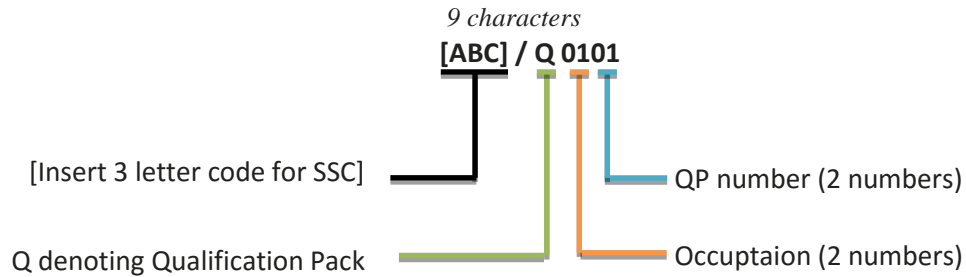


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Annexure

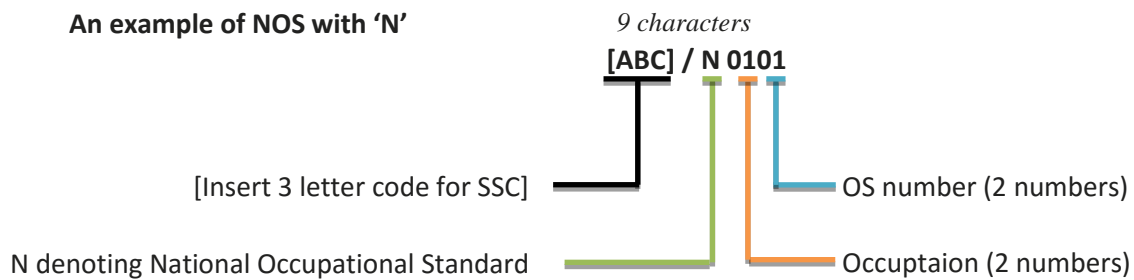
Nomenclature for QP and NOS

Qualification 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	00-29
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 VFD Programmer and Troubleshooter

Qualification Pack IAS/Q8004

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. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria.
5. 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.

Assessment outcomes	Assessment Criteria for outcomes	Marks Allocation			
		Total Mark (490)	Out Of	Theory	Skills Practical
1.IAS/N2300 Application know how and basic knowledge of VFD and Motor selection	PC1. Interact with customer and understand the application for which VFD is required	90	10	10	0
	PC2. Understand and examine the site location where the VFD panel will be mounted		10	5	5
	PC3. Avail technical write up of the application from customer		5	5	0
	PC4. Submit detail information to fabricator and technicians to prepare the VFD panel		10	10	0
	PC5. Interact with the customer for readiness of site		5	5	0
	PC6. Understand Motor HP(Horse Power) so that the corresponding VFD will be selected		10	10	0
	PC7. Interact and collect information from customer regarding the Motor specifications		10	5	5
	PC8. Collect selected motor's name plate data like speed, operating voltage, frequency, ampere ratings, motor type etc.		10	0	10
	PC9. Examine the information and select an appropriate VFD as per the Motor specifications and application		10	10	0

	PC10. Mount the VFD in the panel and perform preliminary tests		10	0	10
		Total	90	60	30
2.IAS/N2301 Commissioning and testing of VFD using various tools onsite with motor	PC1. Prior to power up a VFD a cold test is to be done to check the healthiness of VFD.	190	10	0	10
	PC2. Ensure proper connection of cables to the power terminals.		5	0	5
	PC3. Carry out a continuity test with the help of as per drawings.		5	0	5
	PC4. The VFD can be powered on after the above mentioned steps have been carried out successfully.		5	0	5
	PC5. Understand the wiring diagrams between the VFD and the equipments/components used in panel		10	5	5
	PC6. Understand the ferrule numbers used for the wiring in panel		5	0	5
	PC7. Understand the variants of Input equipments like switches, push buttons, Limit switches etc. used in panel		5	0	5
	PC8. Understand the variants of Output equipment like LED, lamps, exhaust fans etc. used in the panel		5	0	5
	PC9. Understand the equipments like relays, contactors etc used in panel		5	0	5
	PC10. Understand the terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc.		5	0	5
	PC11. Identify the Organization/Customer approved Software and use it for configuring the parameter.		10	5	5
	PC12. Collect information related to pre-requisites for software installation on PC/Laptops for programming		5	5	0
	PC13. Ensure the communication protocol to be used for communicating between programming software and VFD		5	5	0
	PC14. Check the availability of the communication port on PC/Laptop		5	0	5
	PC15. As per motor the required set of basic parameter to be select.		10	5	5
	PC16. As per application the required set of function parameter to be select.		10	5	5
	PC17. Create a new project in offline		5	0	5
	PC18. Check the program with test bench if possible.		10	0	10

	PC19. Discuss and get permission from customer for downloading the parameters to VFD	5	5	0	
	PC20. Transfer the parameter in the VFD Control unit	5	0	5	
	PC21. Check the VFD program by activating sensors, switches or push buttons and examine the function of outputs	10	0	10	
	PC22. Inform customer about the preliminary check of IO's and gather information about availability of resources for trial runs	5	5	0	
	PC23. Get permissions from customer for execution of process through VFD program	5	0	5	
	PC24. Identify errors in program and redo the logic after customer suggestion and maintain the standards	10	5	5	
	PC25. Ensure during trial runs error handling program works correctly to avoid sudden loss of productivity and attain a smooth shutdown if necessary	10	5	5	
	PC26. Train the operators to educate them the sequence of operation in case of emergency	5	0	5	
	PC27. Prepare a standard operating procedure (SOP) for the automation logic developed for the customer	5	5	0	
	PC28. Collect the backup of the final VFD program and submit a copy to the plant head for future reference	5	0	5	
	PC29. Sign a report (MOM) for correctly completing the installation & commissioning of the plant.	5	5	0	
	Total	190	60	130	
3.IAS/N2302 Diagnostics and Maintenance of VFD	PC1. Collect the issues in the machine from the customer	140	10	10	0
	PC2. Prepare document before using a VFD to rectify the problem		10	10	0
	PC3. Prepare a flow chart before troubleshooting any machine		10	10	0
	PC4. Check the control drawing of the machine/plant connected with the VFD		10	5	5
	PC5. Check the availability of modules, equipment and electrical component on site		10	5	5
	PC6. Refer the setting of instrument and installation guidelines		5	5	0
	PC7. Providing the module replacement to the customer according to VFD		5	5	0
	PC8. Check the availability of software and program backup		5	5	0

	PC9. Before testing, Check main power is off	5	0	5
	PC10. Check earthing and control supply	5	0	5
	PC11. Check VFD module healthiness	5	0	5
	PC12. Make changes in running project if required to rectify the fault	10	0	10
	PC13. At the time of troubleshooting check the connected devices are in operation or in stop	10	0	10
	PC14. Change the parameter if problem coming is from software side	10	0	10
	PC15. Replace the module/equipment if it is found faulty	5	0	5
	PC16. Take program backup before and after troubleshooting	5	0	5
	PC17. Get the parameter reading according to schedule	5	0	5
	PC18. Install, test and startup machine on site	5	0	5
	PC19. Prepare a site report after troubleshooting and mention the remedy	10	10	0
	Total	140	65	75
4.IAS/N2005 Health and Safety in Workplace	PC1. Comply with general and special safety procedures followed in the Company	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 games	5	0	5
	PC13. Handle heavy and hazardous materials with care and using appropriate tools and handling	5	0	5
	70			

equipment such as trolleys, jacks and ladders				
	Total	70	30	40

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