



Programmable Logic Controller (PLC) Programmer and Troubleshooter

QP Code: IAS/Q5604

Version: 3.0

NSQF Level: 4

Instrumentation, Automation, Surveillance & Communication Sector Skill Council || IASC SSC, 201-202,
STBP NSIC Complex, Okhla Industrial Estate, New Delhi
110020 || email:ceo@iascsectorskillcouncil.in

Qualification Pack

Contents

IAS/Q5604: Programmable Logic Controller (PLC) Programmer and Troubleshooter	3
<i>Brief Job Description</i>	3
Applicable National Occupational Standards (NOS)	3
<i>Compulsory NOS</i>	3
<i>Qualification Pack (QP) Parameters</i>	3
IAS/N5610: Develop PLC program using related software	5
IAS/N5611: Test the PLC program using simulators	12
IAS/N5612: Commission and test the PLC program using trial runs on site	18
IAS/N5613: Troubleshoot faults in the machine or process plant	24
IAS/N9001: Work effectively with teams	30
IAS/N9002: Health and safety in workplace	37
DGT/VSQ/N0102: Employability Skills (60 Hours)	45
Assessment Guidelines and Weightage	52
<i>Assessment Guidelines</i>	52
<i>Assessment Weightage</i>	53
Acronyms	54
Glossary	55

Qualification Pack

IAS/Q5604: Programmable Logic Controller (PLC) Programmer and Troubleshooter

Brief Job Description

A PLC programmer and troubleshooter are responsible for controlling various processes of industries involving development, testing and commissioning the PLC program, finding errors, if any, and then fixing the errors or faults, during the operation of the plant.

Personal Attributes

The individual must have attention to details, technical know-how, and the ability to execute the project. The individual should be able to demonstrate strong technical expertise and possess good oral and written communication skills. The individual should also be comfortable working with deadlines.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [IAS/N5610: Develop PLC program using related software](#)
2. [IAS/N5611: Test the PLC program using simulators](#)
3. [IAS/N5612: Commission and test the PLC program using trial runs on site](#)
4. [IAS/N5613: Troubleshoot faults in the machine or process plant](#)
5. [IAS/N9001: Work effectively with teams](#)
6. [IAS/N9002: Health and safety in workplace](#)
7. [DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

Qualification Pack (QP) Parameters

Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Installation and Commissioning(Instrumentation and Automation)
Country	India

Qualification Pack

NSQF Level	4
Credits	15
Aligned to NCO/ISCO/ISIC Code	NCO-2015/8212.2002
Minimum Educational Qualification & Experience	10th grade pass plus 1-year NTC/ NAC (in relevant field) OR 10th Class with 1 Year of experience OR Completed 1st year of 3-year diploma (after 10th) and pursuing regular diploma (in relevant field) OR Previous relevant Qualification of NSQF Level (NSQF Level 3) with 1 Year of experience
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	19 Years
Last Reviewed On	NA
Next Review Date	11/08/2025
NSQC Approval Date	11/08/2020
Version	3.0
Reference code on NQR	2022/EHW/IASC/06503
NQR Version	3

Qualification Pack

IAS/N5610: Develop PLC program using related software

Description

This unit is about developing the PLC program using the related programming software.

Scope

The scope covers the following :

- Perform preparatory work
- Gather and implementing the necessary instruction set
- Develop the program / logic / code for the PLC

Elements and Performance Criteria

Perform preparatory work

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

- PC1.** identify the customer requirement for the PLC control panel including the field equipment and size of control panel
- PC2.** examine the onsite location where control panel will be placed
- PC3.** prepare the dimension of the control panel based on requirement
- PC4.** identify the required layout for mounting of components on the mounting plate inside the control panel
- PC5.** examine the panel fabrication drawing and internal mounting layout drawings to ensure these are as per requirement and standards
- PC6.** identify PLC modules used in the control panel
- PC7.** provide instructions to the fabrication team to give cut-outs on the panel door for mounting of panel HMI and fitting of panel switches

Gather and implement necessary instruction set

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

- PC8.** verify that the printer prints the specified material(s) in the format as per acceptable standards including resolution, and there are no discontinuities, jagged edges or undesirable marks or protrusions on the surface
- PC9.** collect information related to pre-requisites for software installation on PC/laptops for programming
- PC10.** check the availability of the communication protocol, to be used for communication between programming software and PLC
- PC11.** get detailed information on communication program blocks used especially for communication between different components in the panel
- PC12.** acquire and collect information of normally open (NO) and normally closed (NC) contacts in field
- PC13.** gather detailed information about bit instructions, mathematical instructions and conversion instructions and compare instructions to be used in the program

Qualification Pack

PC14. identify the timer and counter logics blocks, along with move data blocks, as required in process logics

PC15. identify the requirement of special blocks like PID, high speed counters etc.

Design and develop the program / logic / code for the PLC

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

PC16. discuss and collect information from customer regarding the equipment and instruments used in the plant

PC17. prepare input-output (IO) list and other PLC module from the inputs given by customer and provide instructions to the control panel makers to incorporate accordingly in the panel

PC18. communicate problem effectively in order to secure customer's confidence

PC19. ensure customer satisfaction and positive feedback

PC20. record minimum customer complaints post service

PC21. avoid occurrence of repetitive problems post service

PC22. prepare optimum route plan to complete daily target visits

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's code of conduct and organisation's culture and reporting structure

KU2. company's documentation policy

KU3. company's line of business and production policy

KU4. departments involved with installation and commissioning

KU5. system of quality and standards followed by the company

KU6. standard operating procedures (SOP) of the organisation for process automation logic development

KU7. basics of computer and operating systems

KU8. basics of machine safety and normal safety processes

KU9. standards and guidelines to be followed during program development

KU10. control system module and technologies used in the automation process

KU11. PLC programming software

KU12. application software, installation and debugging

KU13. piping and instrumentation diagram (P and ID)

KU14. basics on infrastructure process involved in the industry such as water treatment plant, chilling units, etc.

KU15. safety aspects to be inbuilt in the PLC programming as per the process requirement

KU16. sources and methods for obtaining required technical information for the PLC program to be developed

KU17. IEC standards in PLC programming language

KU18. relevant documents to be referred for optimised PLC programming

Generic Skills (GS)

Qualification Pack

User/individual on the job needs to know how to:

- GS1.** compose e-mails, letters and other official documents clearly
- GS2.** write user requirements
- GS3.** write test reports
- GS4.** write technical documentation
- GS5.** write schedules and timelines
- GS6.** read user requirements
- GS7.** read technical specifications
- GS8.** read standards and regulatory compliance documents
- GS9.** read schedules and timelines
- GS10.** read drawings
- GS11.** question customers appropriately in order to understand the application and the requirements
- GS12.** discuss task lists, schedules and work-loads with customers
- GS13.** keep customers informed about the progress of logic development
- GS14.** use simple and clear language when communicating with a customer
- GS15.** choose appropriate PLC programming software
- GS16.** identify the desired number of input-output in the panel
- GS17.** choose the appropriate programming language to optimise logic development
- GS18.** plan and organise project related to requirements, design and integration, testing, installation and commissioning, customer acceptance test and customer feedback
- GS19.** anticipate issues and have alternate strategy
- GS20.** identify needs of the customer and suggest most appropriate solution
- GS21.** manage relationships and maintain good rapport with customers to get detailed inputs on logic
- GS22.** think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)
- GS23.** solve issues of co-workers lacking technical know-how
- GS24.** identify immediate or temporary solutions to resolve delays
- GS25.** use the existing information for improving the PLC program
- GS26.** use the existing information to optimise the logic
- GS27.** analyse problems and identify causes and possible solutions
- GS28.** analyse and evaluate the information gathered from observation, experience, reasoning or communication as a guide to think and take action
- GS29.** anticipate problems, risks and opportunities and utilise these for optimisation of PLC program

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Perform preparatory work</i>	14	16	-	5
PC1. identify the customer requirement for the PLC control panel including the field equipment and size of control panel	2	2	-	1
PC2. examine the onsite location where control panel will be placed	2	2	-	1
PC3. prepare the dimension of the control panel based on requirement	2	2	-	1
PC4. identify the required layout for mounting of components on the mounting plate inside the control panel	2	2	-	1
PC5. examine the panel fabrication drawing and internal mounting layout drawings to ensure these are as per requirement and standards	2	2	-	1
PC6. identify PLC modules used in the control panel	2	3	-	-
PC7. provide instructions to the fabrication team to give cut-outs on the panel door for mounting of panel HMI and fitting of panel switches	2	3	-	-
<i>Gather and implement necessary instruction set</i>	16	17	-	4
PC8. verify that the printer prints the specified material(s) in the format as per acceptable standards including resolution, and there are no discontinuities, jagged edges or undesirable marks or protrusions on the surface	2	3	-	-
PC9. collect information related to pre-requisites for software installation on PC/laptops for programming	2	2	-	1
PC10. check the availability of the communication protocol, to be used for communication between programming software and PLC	2	2	-	1

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. get detailed information on communication program blocks used especially for communication between different components in the panel	2	2	-	-
PC12. acquire and collect information of normally open (NO) and normally closed (NC) contacts in field	2	2	-	1
PC13. gather detailed information about bit instructions, mathematical instructions and conversion instructions and compare instructions to be used in the program	2	2	-	-
PC14. identify the timer and counter logics blocks, along with move data blocks, as required in process logics	2	2	-	-
PC15. identify the requirement of special blocks like PID, high speed counters etc.	2	2	-	1
<i>Design and develop the program / logic / code for the PLC</i>	10	17	-	1
PC16. discuss and collect information from customer regarding the equipment and instruments used in the plant	2	2	-	-
PC17. prepare input-output (IO) list and other PLC module from the inputs given by customer and provide instructions to the control panel makers to incorporate accordingly in the panel	2	3	-	-
PC18. communicate problem effectively in order to secure customer's confidence	2	2	-	-
PC19. ensure customer satisfaction and positive feedback	1	2	-	1
PC20. record minimum customer complaints post service	1	2	-	-
PC21. avoid occurrence of repetitive problems post service	1	3	-	-
PC22. prepare optimum route plan to complete daily target visits	1	3	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5610
NOS Name	Develop PLC program using related software
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Installation and Commissioning(Instrumentation and Automation)
NSQF Level	4
Credits	2
Version	2.0
Last Reviewed Date	NA
Next Review Date	11/08/2025
NSQC Clearance Date	11/08/2020

Qualification Pack

IAS/N5611: Test the PLC program using simulators

Description

This unit is specifically designed to prepare learners with the required learning outcomes needed to test the PLC program using simulator.

Scope

The scope covers the following :

- Download / transfer the PLC program in PC-based software simulators
- Test the program using hardware simulators
- Develop the error handling program for the PLC and test it

Elements and Performance Criteria

Download / transfer the PLC program in PC-based software simulators

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

- PC1.** download the compilation error-free program and transfer it to the computer based internal software simulator for further checks
- PC2.** activate the respective inputs in software simulator to check the automation logic and thereby identify any error
- PC3.** modify and edit the logical error, data address overlap and wrong IO address access to maximise program stability

Test the program using hardware simulators

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

- PC4.** download the modified software simulated logic into the PLC hardware available in office test bench
- PC5.** connect actual DI, DO, AI and AO modules to check the hardware loading on PLC
- PC6.** connect hardware toggle switches to test program reaction via virtual field inputs
- PC7.** connect hardware LED/ILamps to check output generated from PLC program
- PC8.** connect hardware analog simulators to check analog behaviour of PLC program

Develop the error handling program for the PLC and test it

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

- PC9.** ensure use of appropriate programming logics to avoid non functionality of CPU due to hardware errors
- PC10.** identify and examine hardware related error which may occur during testing of PLC program
- PC11.** execute these error handling programs by physically creating faults like supply failure, communication break, IO channel error, module failure etc.
- PC12.** generate outputs from error handling PLC program for error monitoring on HMI devices like display panels or SCADA systems
- PC13.** ensure completion of factory acceptance test (FAT) and send report to customer

Qualification Pack

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** organisation's policies on customer care
- KU2.** organisation's departments involved with engineering
- KU3.** organisation's code of conduct
- KU4.** organisation's culture and typical customer profile
- KU5.** organisation's reporting structure
- KU6.** organisation's documentation policy and policies on quality and standards
- KU7.** organisation's escalation matrix and procedures for reporting work and employment related issues
- KU8.** basics of computer and operating systems
- KU9.** standard operating procedure (SOP) of the organisation for process automation logic testing in stimulation
- KU10.** safety aspects to be inbuilt in the PLC program testing as per the process requirement
- KU11.** testing process and parameters involved in the testing
- KU12.** sources and methods for obtaining required technical information for the PLC program to be tested
- KU13.** IEC standards in PLC programming language
- KU14.** relevant documents to be referred for testing PLC program

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** complete forms such as work orders, invoices and maintenance records
- GS2.** note problems on job sheet and details of work done
- GS3.** create test reports and other technical documentation
- GS4.** maintain schedules and time charts
- GS5.** read warnings, instructions and other text material on product labels, components, etc.
- GS6.** read work orders/ schedules
- GS7.** read user requirements
- GS8.** read technical specifications
- GS9.** read standards and regulatory compliance documents
- GS10.** convey and share technical information clearly using appropriate language and terminology
- GS11.** check and clarify task-related information
- GS12.** discuss task lists, schedules and workloads with colleagues
- GS13.** keep colleagues /superiors informed about progress of logic testing
- GS14.** ask questions and discuss problems with colleagues/superiors appropriately to understand the nature of the problem and make a diagnosis
- GS15.** report issues and problems to superiors in clear terms

Qualification Pack

- GS16.** select appropriate solution for the faults in hardware
- GS17.** choose appropriate solution for the faults in programming
- GS18.** select appropriate error handling program
- GS19.** plan, prioritise and organise work related to requirements, design and integration, testing, installation and commissioning
- GS20.** organise and collate customer acceptance reports and feedback
- GS21.** maintain productivity by applying time management and efficient resource utilisation
- GS22.** maintain personal hygiene and be well groomed
- GS23.** be polite, patient and courteous under all circumstances and with all types of customers
- GS24.** decide on the spot on whether interaction of customer with superior is necessary or not
- GS25.** maintain proper etiquette such as keeping appropriate physical distance from the customer during conversation, not entering bedroom without permission, etc.
- GS26.** identify needs of the customer and explain the most appropriate solution
- GS27.** build good relationships and rapport with customers to facilitate getting inputs related to program testing from them
- GS28.** work on problems to be able to suggest the best solution
- GS29.** solve issues of co-workers lacking technical know-how
- GS30.** identify immediate or temporary solutions to resolve issues causing delays
- GS31.** use existing information for improving the testing of the program
- GS32.** use existing information to optimise the test cases
- GS33.** analyse issues, identify causes and suggest possible resolutions
- GS34.** analyse and evaluate the information gathered from observation, experience, reasoning or communication as a guide to think and take action
- GS35.** anticipate problems, risks and opportunities and utilise these for optimisation of PLC program

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Download / transfer the PLC program in PC-based software simulators</i>	9	10	-	2
PC1. download the compilation error-free program and transfer it to the computer based internal software simulator for further checks	3	3	-	1
PC2. activate the respective inputs in software simulator to check the automation logic and thereby identify any error	3	3	-	-
PC3. modify and edit the logical error, data address overlap and wrong IO address access to maximise program stability	3	4	-	1
<i>Test the program using hardware simulators</i>	15	16	-	4
PC4. download the modified software simulated logic into the PLC hardware available in office test bench	3	3	-	-
PC5. connect actual DI, DO, AI and AO modules to check the hardware loading on PLC	3	3	-	1
PC6. connect hardware toggle switches to test program reaction via virtual field inputs	3	3	-	1
PC7. connect hardware LED/ILamps to check output generated from PLC program	3	3	-	1
PC8. connect hardware analog simulators to check analog behaviour of PLC program	3	4	-	1
<i>Develop the error handling program for the PLC and test it</i>	16	24	-	4
PC9. ensure use of appropriate programming logics to avoid non functionality of CPU due to hardware errors	3	4	-	-
PC10. identify and examine hardware related error which may occur during testing of PLC program	4	5	-	1

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. execute these error handling programs by physically creating faults like supply failure, communication break, IO channel error, module failure etc.	3	5	-	1
PC12. generate outputs from error handling PLC program for error monitoring on HMI devices like display panels or SCADA systems	3	5	-	1
PC13. ensure completion of factory acceptance test (FAT) and send report to customer	3	5	-	1
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5611
NOS Name	Test the PLC program using simulators
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Installation and Commissioning(Instrumentation and Automation)
NSQF Level	4
Credits	2
Version	2.0
Last Reviewed Date	NA
Next Review Date	11/08/2025
NSQC Clearance Date	11/08/2020

Qualification Pack

IAS/N5612: Commission and test the PLC program using trial runs on site

Description

This OS unit is specifically designed to prepare learners with the required learning outcomes needed for commissioning and testing the PLC program using trial runs onsite.

Scope

The scope covers the following :

- Test the functionality of physical inputs and outputs
- Download / transferring the tested program to the PLC
- Commission the program using trial runs
- Achieve productivity and quality

Elements and Performance Criteria

Test the functionality of physical inputs and outputs

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

- PC1.** collect information from customer about the availability of resources, tools for installation of PLC control panel and time period for completion of the task
- PC2.** check if the wiring between the terminal base of PLC panel and the field devices is completed
- PC3.** check the cable numbering and continuity test report
- PC4.** examine the power supply input to PLC panel and turn it on
- PC5.** activate the field sensors and limit switches, etc. to verify them on input module
- PC6.** activate the PLC outputs to check working of field outputs like actuators, contactors, relays etc.
- PC7.** identify if there are any issues in physical IO check and inform customer

Download / transfer the tested program to the PLC

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

- PC8.** discuss and get permission from customer for downloading the program into the PLC
- PC9.** transfer the PLC program into the CPU at the customer's site
- PC10.** check the PLC program by activating sensors, switches or push buttons and examine the function of outputs

Commission the program using trial runs

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

- PC11.** get permissions from customer for execution of process through PLC program and execute the same
- PC12.** identify errors in program and redo the logic after customer's feedback and maintain the standards
- PC13.** check if the trial runs' error handling program works correctly in order to avoid sudden loss of productivity and attain smooth shutdown

Qualification Pack

Achieve productivity and quality

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

- PC14.** ensure damage free handling of the equipment
- PC15.** diagnose the problem accurately and within assigned time
- PC16.** ensure 100% customer satisfaction

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** organisation's policies on customer care
- KU2.** organisation's departments involved with installation and commissioning
- KU3.** organisation's code of conduct
- KU4.** organisation's culture and typical customer profile
- KU5.** organisation's reporting structure
- KU6.** organisation's documentation policy and policies on quality and standards
- KU7.** standard operating procedures (SOP) of the organisation for commissioning of process plant
- KU8.** electrical concepts, electronics and instrumentation
- KU9.** basics of machine safety and normal safety processes
- KU10.** quality, standards and guidelines to be followed during installation and commissioning
- KU11.** PLC module and technologies used in the automation process
- KU12.** instrumentation used in the factory and its wiring concept
- KU13.** testing process and parameters involved in the testing
- KU14.** how to communicate with shop floor technicians in order to resolve any discrepancies during commissioning
- KU15.** basic power systems, motor fundamentals, drive systems fundamentals
- KU16.** relevant documents and documentation procedures used in the process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill appropriate forms, activity logs, attendance sheets as per the organisation's format in English and/or local language
- GS2.** write email to communicate within and outside the organisation as per the organisation's guidelines
- GS3.** create test reports and other documentation
- GS4.** read work orders / schedules
- GS5.** read user requirements
- GS6.** read technical specifications
- GS7.** read standards and regulatory compliance documents

Qualification Pack

- GS8.** read schedules, time charts and drawings
- GS9.** convey and share technical information clearly, using appropriate language and terminology
- GS10.** check and clarify task-related information
- GS11.** discuss task lists, schedules and workloads with colleagues
- GS12.** keep colleagues / superiors informed about progress of logic testing
- GS13.** ask questions and discuss problems with colleagues / superiors appropriately to understand the nature of the problem and make a diagnosis
- GS14.** report issues and problems to superiors in clear terms
- GS15.** work in teams to devise creative solutions
- GS16.** plan and organise own tasks
- GS17.** multi-task, handle additional responsibility and adapt quickly to changing priorities
- GS18.** select appropriate solution for faults in the hardware
- GS19.** decide whether the customer site is ready for commissioning and testing
- GS20.** plan, prioritise and organise work related to requirements, design and integration, testing, installation and commissioning
- GS21.** organise and collate customer acceptance reports and feedback
- GS22.** maintain productivity by applying time management and efficient resource utilisation
- GS23.** identify customer needs and suggest the best solution
- GS24.** support customer when they need help
- GS25.** ensure customer satisfaction after job completion
- GS26.** build customer relationships and rapport to ensure smooth commissioning
- GS27.** identify the problem, evaluate the possible solution(s) and suggest an optimum/best possible solution(s)
- GS28.** solve problems of co-workers during commissioning
- GS29.** identify immediate or temporary solutions to resolve issues causing delays and implement the proper solution when possible
- GS30.** analyse and evaluate the information gathered from observation, experience, reasoning, or communication as a guide for thought and action
- GS31.** anticipate problems, risks and opportunities and utilise these for optimising the commissioning

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Test the functionality of physical inputs and outputs</i>	17	23	-	5
PC1. collect information from customer about the availability of resources, tools for installation of PLC control panel and time period for completion of the task	2	3	-	1
PC2. check if the wiring between the terminal base of PLC panel and the field devices is completed	3	4	-	-
PC3. check the cable numbering and continuity test report	2	3	-	1
PC4. examine the power supply input to PLC panel and turn it on	3	4	-	-
PC5. activate the field sensors and limit switches, etc. to verify them on input module	2	3	-	1
PC6. activate the PLC outputs to check working of field outputs like actuators, contactors, relays etc.	2	3	-	1
PC7. identify if there are any issues in physical IO check and inform customer	3	3	-	1
<i>Download / transfer the tested program to the PLC</i>	7	10	-	2
PC8. discuss and get permission from customer for downloading the program into the PLC	2	4	-	-
PC9. transfer the PLC program into the CPU at the customer's site	2	3	-	1
PC10. check the PLC program by activating sensors, switches or push buttons and examine the function of outputs	3	3	-	1
<i>Commission the program using trial runs</i>	8	10	-	1
PC11. get permissions from customer for execution of process through PLC program and execute the same	2	4	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. identify errors in program and redo the logic after customer's feedback and maintain the standards	3	3	-	1
PC13. check if the trial runs' error handling program works correctly in order to avoid sudden loss of productivity and attain smooth shutdown	3	3	-	-
<i>Achieve productivity and quality</i>	8	7	-	2
PC14. ensure damage free handling of the equipment	3	2	-	1
PC15. diagnose the problem accurately and within assigned time	3	2	-	1
PC16. ensure 100% customer satisfaction	2	3	-	-
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5612
NOS Name	Commission and test the PLC program using trial runs on site
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Installation and Commissioning(Instrumentation and Automation)
NSQF Level	4
Credits	3
Version	2.0
Last Reviewed Date	NA
Next Review Date	11/08/2025
NSQC Clearance Date	11/08/2020

Qualification Pack

IAS/N5613: Troubleshoot faults in the machine or process plant

Description

This unit is specifically designed to prepare learners with the required learning outcomes needed for troubleshooting of faults in a machine or process plant.

Scope

The scope covers the following :

- Gather information about products, hardware and software support
- Test working of machine and the process plant
- Install replaced products and schedule tasks

Elements and Performance Criteria

Gather information about products, hardware and software support

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

- PC1.** collect information from customer about the availability of resources, tools for installation of PLC control panel and time period for completion of the task
- PC2.** identify problem in the machine/plant by asking the supervisor/engineer
- PC3.** obtain the control drawing of the machine/plant connected with the PLC and the different modules
- PC4.** check if the modules, equipment and electrical components are available onsite
- PC5.** check if the installation has been done as per installation guidelines
- PC6.** ensure that the software and program backup are available in the plant

Test working of machine and the process plant

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

- PC7.** prepare a flow chart for troubleshooting any machine/plant
- PC8.** test the panel and modules for proper functioning as recommended
- PC9.** check earthing and power supply for proper functioning before troubleshooting
- PC10.** cross-check whether the PLC and its module is attached at right place
- PC11.** verify whether the communication cable is supporting the protocol or not
- PC12.** make changes in running project if it is required to rectify the faults
- PC13.** check if the connected devices are in operation or have stopped at the time of troubleshooting
- PC14.** enter parameter of the connected load accurately in PLC
- PC15.** get the parameter reading according to schedule
- PC16.** prepare a site report after troubleshooting and mention the remedy

Install replaced products and schedule tasks

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

Qualification Pack

- PC17.** match the product according to the catalogue number with the drawing and material list
- PC18.** take a program backup before and after troubleshooting
- PC19.** replace the module/equipment if it is found faulty and provide the module replacement to the customer according to PLC

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** organisation's policies on customer care
- KU2.** organisation's departments involved with troubleshooting
- KU3.** organisation's code of conduct
- KU4.** organisation's culture and typical customer profile
- KU5.** organisation's reporting structure
- KU6.** organisation's documentation policy and policies on quality and standards
- KU7.** standard operating procedures (SOP) of the organisation for commissioning of process plant
- KU8.** electrical concepts, electronics and instrumentation
- KU9.** basics of machine safety and normal safety processes
- KU10.** basics of computer and operating systems
- KU11.** quality, standards and guidelines to be followed during troubleshooting
- KU12.** PLC module and equipment used in the automation process
- KU13.** PLC programming software
- KU14.** application software, installation and debugging
- KU15.** general arrangement drawing
- KU16.** piping and instrumentation diagram (P and ID)
- KU17.** instrumentation used in the factory and its wiring concept
- KU18.** electrical panel and wiring
- KU19.** testing process and parameters involved in the testing
- KU20.** electronics indicators, switchgear and panel accessories
- KU21.** relevant regulations, standards and codes of practice and their implications on the troubleshooting
- KU22.** how to communicate with shop floor technicians in order to resolve any discrepancies during troubleshooting
- KU23.** basic power systems, motor fundamentals and drive system fundamentals

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill appropriate forms, activity logs, attendance sheets as per the organisation's format in English and/or local language

Qualification Pack

- GS2.** write email to communicate within and outside the organisation as per the organisation's guidelines
- GS3.** create test reports and other documentation
- GS4.** read work orders / schedules
- GS5.** read user requirements
- GS6.** read technical specifications
- GS7.** read standards and regulatory compliance documents
- GS8.** read schedules, time charts and drawings
- GS9.** convey and share technical information clearly, using appropriate language and terminology
- GS10.** check and clarify task-related information
- GS11.** discuss task lists, schedules and workloads with colleagues
- GS12.** keep colleagues / superiors informed about progress of logic testing
- GS13.** ask questions and discuss problems with colleagues / superiors appropriately to understand the nature of the problem and make a diagnosis
- GS14.** report issues and problems to superiors in clear terms
- GS15.** decide whether the customer's site is ready for troubleshooting
- GS16.** plan, prioritise and organise work related to requirements, design and integration, testing, installation and commissioning
- GS17.** organise and collate customer acceptance reports and feedback
- GS18.** maintain productivity by applying time management and efficient resource utilisation
- GS19.** identify customer needs and suggest the best solution
- GS20.** support customer when they need help
- GS21.** ensure customer satisfaction after job completion
- GS22.** build customer relationships and rapport to help the customer in self-troubleshooting the plant by availing online assistance
- GS23.** identify the problem, evaluate the possible solution(s) and suggest an optimum/best possible solution(s)
- GS24.** solve problems of co-workers during commissioning
- GS25.** identify immediate or temporary solutions to resolve issues causing delays and implement the proper solution when possible
- GS26.** use existing information to arrive at course of actions
- GS27.** use existing information for improving the customer satisfaction
- GS28.** use existing information to optimise solution and bring machine/plant in running state
- GS29.** analyse problems and identify causes and possible solutions
- GS30.** analyse and evaluate the information gathered from observation, experience, reasoning, or communication as a guide for thought and action
- GS31.** anticipate problems, risks and opportunities and utilise these for optimising the commissioning

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Gather information about products, hardware and software support</i>	12	18	-	5
PC1. collect information from customer about the availability of resources, tools for installation of PLC control panel and time period for completion of the task	2	3	-	1
PC2. identify problem in the machine/plant by asking the supervisor/engineer	2	3	-	1
PC3. obtain the control drawing of the machine/plant connected with the PLC and the different modules	2	3	-	1
PC4. check if the modules, equipment and electrical components are available onsite	2	3	-	1
PC5. check if the installation has been done as per installation guidelines	2	3	-	1
PC6. ensure that the software and program backup are available in the plant	2	3	-	-
<i>Test working of machine and the process plant</i>	21	25	-	5
PC7. prepare a flow chart for troubleshooting any machine/plant	2	3	-	1
PC8. test the panel and modules for proper functioning as recommended	2	3	-	1
PC9. check earthing and power supply for proper functioning before troubleshooting	2	3	-	1
PC10. cross-check whether the PLC and its module is attached at right place	2	2	-	-
PC11. verify whether the communication cable is supporting the protocol or not	2	2	-	-
PC12. make changes in running project if it is required to rectify the faults	2	3	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. check if the connected devices are in operation or have stopped at the time of troubleshooting	2	3	-	-
PC14. enter parameter of the connected load accurately in PLC	2	2	-	1
PC15. get the parameter reading according to schedule	2	2	-	1
PC16. prepare a site report after troubleshooting and mention the remedy	3	2	-	-
<i>Install replaced products and schedule tasks</i>	7	7	-	-
PC17. match the product according to the catalogue number with the drawing and material list	2	3	-	-
PC18. take a program backup before and after troubleshooting	2	2	-	-
PC19. replace the module/equipment if it is found faulty and provide the module replacement to the customer according to PLC	3	2	-	-
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5613
NOS Name	Troubleshoot faults in the machine or process plant
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Installation and Commissioning(Instrumentation and Automation)
NSQF Level	4
Credits	2
Version	2.0
Last Reviewed Date	NA
Next Review Date	11/08/2025
NSQC Clearance Date	11/08/2020

Qualification Pack

IAS/N9001: Work effectively with teams

Description

This NOS unit is about building relationships and working with people and groups inside and outside the organization, using skills and habits, to achieve the team goals and objectives.

Scope

The scope covers the following :

- Work as per organisational team environment
- Communicate effectively
- Co-operate with team members and superiors
- Respect customs / preferences and gender / ability differences "

Elements and Performance Criteria

Work as per the organisational team environment

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

- PC1.** identify team objectives and goals, team members by name, their role and responsibilities, greet them appropriately and respond to their greetings
- PC2.** comply with organisation's policies and procedures for working with team members within and outside the organisation—especially related to privacy, confidentiality and security
- PC3.** work as per the environment to build trust and mutual respect
- PC4.** participate in decision making by providing facts and figures, give / accept constructive suggestions, take initiatives to help team members arrive at workable decisions and meet the goals
- PC5.** accept decisions professionally and support even if they do not match suggestions and personal views

Communicate effectively

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

- PC6.** communicate professionally as per organisation's protocols, using appropriate mode of communication—verbal, written, mail, phone or text—and clearly articulate the message to ensure that the receiver understands the message
- PC7.** listen to team members attentively, respond promptly, seek / provide clarifications if required
- PC8.** share important information with the team timely and refrain from overloading them with unnecessary and unsolicited information

Co-operate with team members and superiors

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

- PC9.** perform own role, receive inputs from others and make adjustments within permissible rules as per requirement, to produce output in time for other team members to follow

Qualification Pack

- PC10.** help team members to perform their role effectively and provide any clarifications/support they need, including tools /equipment / common resources as well as resolve any contentious issues amicably, involving the team lead or the supervisor if needed
- PC11.** let team members know in good time if commitments cannot be carried out, explaining the reasons, and provide alternate solutions, if any; let the team lead know about this
- PC12.** act in the interest of the team and the organisation, take initiative to correct the wrong, seek help or escalate if needed to ensure that things do not 'fall through the gap' and team goals are achieved

Respect customs / preferences and gender / ability differences

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

- PC13.** follow organisation's policies and statutory guidelines w.r.t seeking information about others' customs / preferences, making references or comments on social customs / preferences, and refrain from hurting sentiments
- PC14.** accommodate team members' preferences to the extent feasible, and in case they come in the way of fulfilling team goals, discuss with the supervisor/ team leader
- PC15.** ensure personal behaviour, conduct and communication styles, taking gender and disability of the person into consideration
- PC16.** list the different types of disabilities with their respective issues and ways to help them overcome challenges
- PC17.** use inclusive language, verbal as well as non-verbal, irrespective of the disability and the gender of the person
- PC18.** ensure equal treatment for all clients, colleagues and co-workers while respecting their personal space

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** Organisation's policies on dress code , workplace behaviour , performance management,incentives,delivery standards,information security,etc.
- KU2.** Organisation's hierarchy and escalation matrix
- KU3.** importance of the individual's role in the workflow
- KU4.** work area inspection procedures and practices
- KU5.** different types of information that colleagues might need and the importance of providing this information when it is required
- KU6.** deeper understanding of actions and consequences of gender based behaviour
- KU7.** knowledge of gender based concepts, issues and legislation
- KU8.** organisation standards and guidelines to be followed for PwD and knowledge about laws, acts and provisions defined for PwD by the statutory bodies and the right way to use them including various medical conditions associated with PwD
- KU9.** health and safety requirements at workplace for PwD and information about various institutes working for PwD to enable in providing livelihood opportunities for PwD
- KU10.** rights and duties at workplace with respect to PwD and various government / private schemes and benefits available for PwD

Qualification Pack

KU11. process of recruiting people for a particular job profile w.r.t PwD and gender including rights and duties at workplace with respect to gender sensitivity

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** complete forms such as work orders, invoices and maintenance records
- GS2.** fill up appropriate forms, activity logs and attendance sheets as per the organisation's format in English and/or local language
- GS3.** write basic accident or incident report as witnessed in an appropriate format to the relevant authority
- GS4.** read warnings, instructions and other text material on product labels, components, etc.
- GS5.** read relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out work activities
- GS6.** listen effectively and orally communicate information
- GS7.** ask for clarification and advice from the concerned person
- GS8.** make decisions on a suitable course of action or response keeping in view resource utilisation while meeting
- GS9.** plan and organise work to achieve targets and deadlines
- GS10.** understand needs of the customer, suggest most appropriate solution and support them whenever needed
- GS11.** match symptoms of the fault noticed to the cause of the problem
- GS12.** anticipate and avoid hazards that may occur during repairs because of tools, materials used or repair processes
- GS13.** spot process disruptions and delays
- GS14.** practice and acceptance of gender and its concepts
- GS15.** develop empathy across genders and towards PwD
- GS16.** reflect on own gender identity, gender roles and PwD issues
- GS17.** engage and participate in discussions to end gender and disability discrimination
- GS18.** improve and modify work practices
- GS19.** maintain positive and effective relationships with colleagues and customers

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work as per the organisational team environment</i>	15	8	-	5
PC1. identify team objectives and goals, team members by name, their role and responsibilities, greet them appropriately and respond to their greetings	4	4	-	-
PC2. comply with organisation's policies and procedures for working with team members within and outside the organisation—especially related to privacy, confidentiality and security	4	-	-	2
PC3. work as per the environment to build trust and mutual respect	2	-	-	1
PC4. participate in decision making by providing facts and figures, give / accept constructive suggestions, take initiatives to help team members arrive at workable decisions and meet the goals	4	4	-	1
PC5. accept decisions professionally and support even if they do not match suggestions and personal views	1	-	-	1
<i>Communicate effectively</i>	6	10	-	1
PC6. communicate professionally as per organisation's protocols, using appropriate mode of communication—verbal, written, mail, phone or text—and clearly articulate the message to ensure that the receiver understands the message	2	6	-	1
PC7. listen to team members attentively, respond promptly, seek / provide clarifications if required	2	-	-	-
PC8. share important information with the team timely and refrain from overloading them with unnecessary and unsolicited information	2	4	-	-
<i>Co-operate with team members and superiors</i>	8	18	-	1

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. perform own role, receive inputs from others and make adjustments within permissible rules as per requirement, to produce output in time for other team members to follow	2	6	-	-
PC10. help team members to perform their role effectively and provide any clarifications/support they need, including tools /equipment / common resources as well as resolve any contentious issues amicably, involving the team lead or the supervisor if needed	-	6	-	1
PC11. let team members know in good time if commitments cannot be carried out, explaining the reasons, and provide alternate solutions, if any; let the team lead know about this	2	-	-	-
PC12. act in the interest of the team and the organisation, take initiative to correct the wrong, seek help or escalate if needed to ensure that things do not 'fall through the gap' and team goals are achieved	4	6	-	-
<i>Respect customs / preferences and gender / ability differences</i>	11	14	-	3
PC13. follow organisation's policies and statutory guidelines w.r.t seeking information about others' customs / preferences, making references or comments on social customs / preferences, and refrain from hurting sentiments	2	4	-	-
PC14. accommodate team members' preferences to the extent feasible, and in case they come in the way of fulfilling team goals, discuss with the supervisor/ team leader	2	-	-	1
PC15. ensure personal behaviour, conduct and communication styles, taking gender and disability of the person into consideration	2	6	-	1
PC16. list the different types of disabilities with their respective issues and ways to help them overcome challenges	1	-	-	1

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. use inclusive language, verbal as well as non-verbal, irrespective of the disability and the gender of the person	2	4	-	-
PC18. ensure equal treatment for all clients, colleagues and co-workers while respecting their personal space	2	-	-	-
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N9001
NOS Name	Work effectively with teams
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Generic
NSQF Level	4
Credits	1
Version	4.0
Last Reviewed Date	NA
Next Review Date	26/05/2025
NSQC Clearance Date	26/05/2022

Qualification Pack

IAS/N9002: Health and safety in workplace

Description

This OS unit is about following adequate safety procedures to make work environment safe

Scope

The scope covers the following :

- Adhere to standard safety procedures of the company
- Maintain good health and posture
- Effective waste management/recycling practices
- Adopt learning and self-direction
- Develop system thinking in problem solving
- Material/Resources conservation practices

Elements and Performance Criteria

Adhere to standard safety procedures of the company

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

- PC1.** comply with general safety procedures and those for handling an equipment, hazardous material or tool, followed in the company
- PC2.** remove finger rings or any other metal objects likely to interfere with the work before working on the unit
- PC3.** use of safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.
- PC4.** escalate the issue about hazardous materials or things found in the premises or any breach of safety procedure in the company
- PC5.** ensure zero accidents at work
- PC6.** avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence
- PC7.** participate regularly in fire drills or other safety related workshops organised by the company

Maintain good health and posture

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

- PC8.** maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials
- PC9.** participate in company organised health sessions such as yoga, physiotherapy or games
- PC10.** handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools and handling equipment such as trolleys, jacks and ladders

Effective waste management/recycling practices

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

- PC11.** identify recyclable and non-recyclable, and hazardous waste generated to be segregated accordingly

Qualification Pack

PC12. dispose non-recyclable waste and hazardous waste as per recommended processes

PC13. deposit recyclable and reusable material at identified location

Adopt learning and self-direction

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

PC14. understand importance of skill advancement and develop mastery

PC15. adapt product / service to meet success criteria

PC16. understand accountability for timely completion of tasks

PC17. manage to express emotions in appropriate ways at workplace and understand the cause for the emotions

Develop system thinking in problem solving

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

PC18. analyse the problem accurately and communicate different possible solutions to the problem

PC19. manage to estimate the cause of the problem and validate

Material/Resources conservation practices

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

PC20. identify ways to optimize usage of material including water and electricity / energy in various tasks/activities/processes

PC21. check for spills/leakages in various tasks/activities/processes and plug them or escalate to appropriate authority

PC22. carry out routine cleaning of tools, machines and equipment

PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required and report malfunctioning (fumes/sparks/emission/vibration/noise) or any lapse in maintenance of equipment

PC24. ensure electrical equipment and appliances are properly connected and turned off when not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's policies on incentives, delivery standards, and personnel management

KU2. company occupational safety and health policy

KU3. company emergency evacuation procedure

KU4. Company's medical policy

KU5. how to maintain the work area safe and secure

KU6. how to handle hazardous materials, tools and equipment

KU7. procedures to be followed during emergencies such as fire accidents, electrocution, etc.

KU8. long term value of good posture and use of appropriate handling equipment

KU9. electrical grounding practices

KU10. safety regulations and standards and how to apply these

KU11. common sources of pollution and ways to minimize it

Qualification Pack

- KU12.** categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics
- KU13.** usage of different colours of dustbins
- KU14.** waste management and methods of waste disposal
- KU15.** organisation's procedures for minimizing mistakes
- KU16.** strategies pertinent to their field (such as internet searches, asking peers and managers, enrolling for courses and certifications, etc.) that can be used to pursue an advancement in their skills
- KU17.** one should be able to identify the key performance indicators for the new tasks
- KU18.** seek feedback from supervisor and deal in constructive manner
- KU19.** understand that emotions are accompanied by a physical state, thought and feeling
- KU20.** one should be able to interpret timelines and goals set by the manager and break them into sub-goals and tasks
- KU21.** importance of quality and timely delivery of the product/service
- KU22.** potential hazards, risks and threats based on the nature of work
- KU23.** ways of efficiently managing material and water in the process
- KU24.** layout of the workstation and electrical and thermal equipment used
- KU25.** efficient and inefficient utilization of material and water
- KU26.** basics of electricity and prevalent energy efficient devices
- KU27.** ways to recognize common electrical problems
- KU28.** common practices of conserving electricity

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill up appropriate forms, activity logs and attendance sheets as per organisation's format in English and/or local language
- GS2.** write basic accident or incident report as witnessed in appropriate format to relevant authority
- GS3.** read/listen and interpret information correctly from relevant instruction documents, manuals, health and safety instructions, memos, etc. applicable to the job, in English and/or local language
- GS4.** read relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out work activities
- GS5.** question co-workers in order to understand the safety and health issues
- GS6.** inform co-workers about safety and health issues
- GS7.** report issues and problems relating to safety and health to managers in clear terms
- GS8.** make decisions pertaining to safety and health issues at workplace
- GS9.** plan and organise work conforming to the safety and health norms of the company
- GS10.** make decisions about escalating safety and health issues at workplace to managers

Qualification Pack

- GS11.** discuss problems related to safety and health, evaluate the possible solution(s) and arrive at optimum /best possible solution(s) in consultation with concerned people
- GS12.** use the existing information to arrive at actionable decision points
- GS13.** use the existing information for improving customer satisfaction
- GS14.** use the existing information to optimise solution and company business
- GS15.** analyse problems and identify causes and possible solutions
- GS16.** apply, analyse and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action
- GS17.** anticipate problems, risks and opportunities and utilise these for mitigation and business optimisation
- GS18.** communicate with colleagues on the significance of greening of jobs
- GS19.** identify cause and effect of greening of jobs
- GS20.** record data on waste disposal at workplace
- GS21.** demonstrate commitment towards self, and initiative to advance skills levels by exploring various pathways to expand one's own learning
- GS22.** incorporate feedback into one's mental model of task, and bring it into practice
- GS23.** be punctual, utilize time and manage workload efficiently
- GS24.** evaluate strategies to maintain, enhance or reduce the intensity of heightened emotional response
- GS25.** test a hypothesis about the cause of the problem
- GS26.** identify and ask significant questions to clarify the various points of view on the problem to better understand the problem
- GS27.** record data on waste disposal at workplace
- GS28.** make timely decisions for efficient utilization of resources
- GS29.** complete statutory documents relevant to safety and hygiene
- GS30.** read Standard Operating Practices (SOP) documents
- GS31.** communicate with colleagues on the significance of greening of jobs
- GS32.** complete tasks efficiently and accurately within stipulated time
- GS33.** work with supervisors/team members to carry out work related tasks
- GS34.** identify cause and effect of greening of jobs

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Adhere to standard safety procedures of the company</i>	13	12	-	5
PC1. comply with general safety procedures and those for handling an equipment, hazardous material or tool, followed in the company	2	2	-	1
PC2. remove finger rings or any other metal objects likely to interfere with the work before working on the unit	2	4	-	-
PC3. use of safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	4	2	-	1
PC4. escalate the issue about hazardous materials or things found in the premises or any breach of safety procedure in the company	1	1	-	-
PC5. ensure zero accidents at work	1	1	-	1
PC6. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence	1	1	-	1
PC7. participate regularly in fire drills or other safety related workshops organised by the company	2	1	-	1
<i>Maintain good health and posture</i>	6	8	-	1
PC8. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials	2	3	-	1
PC9. participate in company organised health sessions such as yoga, physiotherapy or games	2	1	-	-
PC10. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools and handling equipment such as trolleys, jacks and ladders	2	4	-	-
<i>Effective waste management/recycling practices</i>	4	5	-	1

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. identify recyclable and non-recyclable, and hazardous waste generated to be segregated accordingly	2	1	-	1
PC12. dispose non-recyclable waste and hazardous waste as per recommended processes	1	3	-	-
PC13. deposit recyclable and reusable material at identified location	1	1	-	-
<i>Adopt learning and self-direction</i>	4	5	-	1
PC14. understand importance of skill advancement and develop mastery	1	1	-	1
PC15. adapt product / service to meet success criteria	1	2	-	-
PC16. understand accountability for timely completion of tasks	1	1	-	-
PC17. manage to express emotions in appropriate ways at workplace and understand the cause for the emotions	1	1	-	-
<i>Develop system thinking in problem solving</i>	2	2	-	1
PC18. analyse the problem accurately and communicate different possible solutions to the problem	1	1	-	-
PC19. manage to estimate the cause of the problem and validate	1	1	-	1
<i>Material/Resources conservation practices</i>	11	18	-	1
PC20. identify ways to optimize usage of material including water and electricity / energy in various tasks/activities/processes	2	2	-	-
PC21. check for spills/leakages in various tasks/activities/processes and plug them or escalate to appropriate authority	1	2	-	-
PC22. carry out routine cleaning of tools, machines and equipment	3	6	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required and report malfunctioning (fumes/sparks/emission/vibration/noise) or any lapse in maintenance of equipment	3	4	-	-
PC24. ensure electrical equipment and appliances are properly connected and turned off when not in use	2	4	-	1
NOS Total	40	50	-	10

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N9002
NOS Name	Health and safety in workplace
Sector	Instrumentation
Sub-Sector	Instrumentation & Automation
Occupation	Generic
NSQF Level	4
Credits	1
Version	2.0
Last Reviewed Date	NA
Next Review Date	11/08/2025
NSQC Clearance Date	11/08/2020

Qualification Pack

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

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

- PC1.** identify employability skills required for jobs in various industries
- PC2.** identify and explore learning and employability portals

Constitutional values - Citizenship

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

- PC3.** recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.
- PC4.** follow environmentally sustainable practices

Becoming a Professional in the 21st Century

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

- PC5.** recognize the significance of 21st Century Skills for employment
- PC6.** practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

Qualification Pack

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

- PC7.** use basic English for everyday conversation in different contexts, in person and over the telephone
- PC8.** read and understand routine information, notes, instructions, mails, letters etc. written in English
- PC9.** write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

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

- PC10.** understand the difference between job and career
- PC11.** prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

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

- PC12.** follow verbal and non-verbal communication etiquette and active listening techniques in various settings
- PC13.** work collaboratively with others in a team

Diversity & Inclusion

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

- PC14.** communicate and behave appropriately with all genders and PwD
- PC15.** escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

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

- PC16.** select financial institutions, products and services as per requirement
- PC17.** carry out offline and online financial transactions, safely and securely
- PC18.** identify common components of salary and compute income, expenses, taxes, investments etc
- PC19.** identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

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

- PC20.** operate digital devices and carry out basic internet operations securely and safely
- PC21.** use e- mail and social media platforms and virtual collaboration tools to work effectively
- PC22.** use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

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

- PC23.** identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research
- PC24.** develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion
- PC25.** identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

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

Qualification Pack

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

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

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

Qualification Pack

- GS1.** read and write different types of documents/instructions/correspondence
- GS2.** communicate effectively using appropriate language in formal and informal settings
- GS3.** behave politely and appropriately with all
- GS4.** how to work in a virtual mode
- GS5.** perform calculations efficiently
- GS6.** solve problems effectively
- GS7.** pay attention to details
- GS8.** manage time efficiently
- GS9.** maintain hygiene and sanitization to avoid infection

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Introduction to Employability Skills</i>	1	1	-	-
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
<i>Constitutional values - Citizenship</i>	1	1	-	-
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	2	4	-	-
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
<i>Basic English Skills</i>	2	3	-	-
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Career Development & Goal Setting</i>	1	2	-	-
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
<i>Communication Skills</i>	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
<i>Diversity & Inclusion</i>	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	2	3	-	-
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
<i>Essential Digital Skills</i>	3	4	-	-
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-
<i>Entrepreneurship</i>	2	3	-	-
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
<i>Customer Service</i>	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship & Jobs</i>	2	3	-	-
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	20	30	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/12/2026
NSQC Clearance Date	30/12/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down a proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the 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 centre (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.

Qualification Pack

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
IAS/N5610.Develop PLC program using related software	40	50	-	10	100	20
IAS/N5611.Test the PLC program using simulators	40	50	-	10	100	20
IAS/N5612.Commission and test the PLC program using trial runs on site	40	50	-	10	100	20
IAS/N5613.Troubleshoot faults in the machine or process plant	40	50	-	10	100	20
IAS/N9001.Work effectively with teams	40	50	-	10	100	5
IAS/N9002.Health and safety in workplace	40	50	-	10	100	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	260	330	-	60	650	100

Qualification Pack

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
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	Qualification Pack
ESD	Electro Static Discharge
IO	Input Output
DI	Digital Input
DO	Digital Output
AI	Analog Input
AO	Analog Output

Qualification Pack

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Qualification Pack

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.