COMPETENCY STANDARD

FOR

PROGRAMMABLE LOGIC CONTROLLER (PLC)

(Light Engineering Sector)

Level: 04

Competency Standard Code: CS-LE-PLC-L4-EN-V1

National Skills Development Authority
Prime Minister's Office, Bangladesh

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Introduction

The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skills ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. "**Programmable Logic Controller (PLC)** " is selected as one of the priority occupations of **Light Engineering** Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in Skills training. Trainees who successfully pass the assessment will receive a qualification in the National Skills Qualification Framework (BNQF) under Bangladesh National Qualification Framework and will be listed on the NSDA's online portal.

This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview

A competency standard is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in Light Engineering Sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guides

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all units of competency for the relevant occupation, trade or job including the unit codes and the unit of competency titles and corresponding elements
- the competency standard that includes the unit of competency, unit descriptor, elements and performance criteria, range of variables, curricular content guide and assessment evidence guide.

Level Descriptors of NSQF (BNQF 1-6)

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/ Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyse, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break information into parts by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and information. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2-Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 –Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

List of Abbreviations

General	
NSDA	National Skills Development Authority
BMET	Bureau of Manpower Employment and Training
ILO	International Labor Organization
ISC	Industry Skills Council
NPVC	National Pre-Vocation Certificate
NSQF	National Skills Qualifications Framework
PPP	Public Private Partnership
SCVC	Standards and Curriculum Validation Committee
SEIP	Skills for Employment Investment Program
STP	Skills Training Provider
UoC	Unit of Competency
Occupation Specific	
BGA	Ball Grid Array
DC	Direct current
EMI	Electro-magnetic interference
ESD	Electro-static discharge
IC	Integrated circuit
IT	Information technology
KPI	Key performance indicator
LCD	Liquid Crystal Display
OHS	Occupational health and safety
PPE	Personal protective equipment
RAM	Random Access Memory
RF	Radio frequency
SMD	Surface mounted device
USB	Universal serial bus

Approval of Competency Standard

Approved by
9th Executive Committee (EC) Meeting of NSDA
Held on 16 June 2022

16.06.22
Md. Saniul Ferdous
Deputy Director (Admin)
National Skills Development Authority
Prime Minister's Office

Deputy Director (Admin)
and
Officer of Secretarial Duties for EC Meeting
National Skills Development Authority

Course Structure

SL	Unit Code and Title		UoC Level	Nominal Duration (Hours)
The Generic Competencies				**55**
1.	GU002L2V1	Apply Occupational Health and Safety (OHS) Procedure in The Workplace	2	15
2.	GU011L4V1	Lead Small Team	4	20
3.	GU006L3V1	Apply Basic IT Skills	3	20
The Sector Specific Competencies				**30**
4.	SULE001L2V1	Interpret Manuals, Sketches and Drawings	2	15
5.	SULE002L2V1	Apply Quality System	2	15
The Occupation Specific Competencies				**275**
6.	OUPLC01L4V1	Execute Sequential Control Using Relay Logic	4	30
7.	OUPLC02L4V1	Perform PLC Installation, Wiring and Configuring	4	70
8.	OUPLC03L4V1	Carry Out Ladder Diagram, Structured Programming and Data Block	4	30
9.	OUPLC04L4V1	Apply PLC for Pneumatic and Hydraulic Control System Application	4	50
10.	OUPLC05L4V1	Apply PLC Based Basic Control System.	4	45
11.	OUPLC06L4V1	Perform Process Visualization (HMI)	4	50
Total Nominal Learning Hours				**360**

Units & Elements at a Glance:

Generic Competencies (55 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU002L2V1	Apply occupational health and safety (OHS) procedure in the workplace	1. Identify OSH policies and procedures 2. Follow OSH procedure 3. Report hazards and risks 4. Respond to emergencies 5. Maintain personal well-being	15
GU011L4V1	Lead small team	1. Provide team leadership 2. Assign responsibilities 3. Set performance expectations for team members 4. Supervise team performance	20
GU006L3V1	Apply basic IT skills	1. Identify and use most commonly used IT Tools 2. Operate computer 3. Work with word processing software 4. Use spread sheet to create /prepare worksheets 5. Use presentation packages to create / prepare presentation 6. Print the documents 7. Use the internet and access E-mail	20

Sector Specific Competencies (30Hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SULE001L2V1	Interpret manuals, sketches and drawings	1. Interpret information and specifications 2. Interpret workplace documents 3. Read and interpret sketches and drawings 4. Practice professional ethics at workplace	15
SULE002L2V1	Apply quality system	1. Work within a quality system 2. Apply and monitor quality system improvement 3. Apply standard procedures for each job	15

Occupation Specific Competencies (275 Hours)

Code	Unit of Competency	Elements of Competency	Hours
OUPLC01L4V1	Execute Sequential Control Using Relay Logic	1. Interpret mechanical switching operation 2. Perform mechanical switching operation 3. Execute timer and counter application 4. Construct latch, DOL and star delta	30
OUPLC02L4V1	Perform PLC Installation, Wiring and Configuring	1. Prepare for works 2. Setup PLC hardware configurations with software tool 3. Setup communication between PLC and PC	70
OUPLC03L4V1	Carry Out Ladder Diagram, Structured Programming and Data Block	1. Prepare for ladder diagram 2. Prepare basic ladder diagram 3. Prepare for structured programming 4. Perform PLC Programming	30
OUPLC04L4V1	Apply PLC for Pneumatic and Hydraulic Control System Application	1. Perform different control applications in pneumatics 2. Perform different control applications in hydraulics	50
OUPLC05L4V1	Apply PLC Based Basic Control System	1. Perform different types of control system 2. Perform two step and multistep controllers 3. Perform PID controls 4. Interpret the tunning PID controller to stabilize the system 5. Apply open loop control system 6. Apply close loop control system	45
OUPLC06L4V1	Perform Process Visualization (HMI)	1. Configure human machine interface (HMI) panel integration 2. Visualize the process	50

Generic Competencies

Unit Code and Title	**GC002L2V1: Apply Occupational Health and Safety (OHS) Procedure in the Workplace**
Unit Descriptor	This unit covers the knowledge, skills and attitudes (KSA) required in applying occupational health and safety (OHS) procedure in the workplace. It specifically includes identify OHS policies and procedures, follow OHS procedure, report hazards and risks, respond to emergencies, and maintaining personal well-being.
Nominal Hours	**15 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Identify OSH policies and procedures	1.1. **OHS policies** and **safe operating procedures** are accessed and stated 1.2. **Safety signs and symbols** are identified and followed 1.3. Emergency response, evacuation procedures and other contingency measures are determined according to workplace requirements
2. Follow OSH procedure	2.1 **Personal protective equipment (PPE)** is selected and collected as required 2.2 Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices 2.3 A clear and tidy workplace is maintained as per workplace standard 2.4 PPE is maintained to keep them operational and compliant with OHS regulations
3. Report hazards and risks.	3.1 **Hazards** and risks are identified, assessed and controlled 3.2 Incidents arising from hazards and risks are reported to designated authority
4. Respond to emergencies	4.1 Alarms and warning devices are responded 4.2 Workplace **emergency procedures** are followed 4.3 **Contingency measures** during workplace accidents, fire and other emergencies are recognized and followed in accordance with organization procedures

	4.4 Frist aid procedures is applied during emergency situations
5. Maintain personal well-being	5.1 OHS policies and procedures are adhered to 5.2 OHS awareness programs are participated in as per workplace guidelines and procedures 5.3 Corrective actions are implemented to correct unsafe condition in the workplace 5.4 **"Fit to work" records** are updated and maintained according to workplace requirements
Range of Variables	
Variables	**Range** (may include but not limited to):
1. OHS policies	1.1. Bangladesh standards for OHS 1.2. Fire Safety Rules and Regulations 1.3. Code of Practice 1.4. Industry Guidelines
2. Safe operating procedures	2.1 Orientation on emergency exits, fire extinguishers, fire escape, etc. 2.2 Emergency procedures 2.3 First Aid procedures 2.4 Tagging procedures 2.5 Use of PPE 2.6 Safety procedures for hazardous substances
3. Safety signs and symbols	3.1 Direction signs (exit, emergency exit, etc.) 3.2 First aid signs 3.3 Danger Tags 3.4 Hazard signs 3.5 Safety tags 3.6 Warning signs
4. Personal Protective Equipment (PPE)	4.1 Gas Mask 4.2 Gloves 4.3 Safety boots 4.4 Face mask 4.5 Overalls 4.6 Goggles and safety glasses 4.7 Sun block 4.8 Chemical/Gas detectors
5. Hazards	5.1 Chemical hazards 5.2 Biological hazards 5.3 Physical Hazards 5.4 Mechanical and Electrical Hazard 5.5 Mental hazard

	5.6 Ergonomic hazard
6. Emergency Procedures	6.1 Fire fighting 6.2 Earthquake 6.3 Medical and first aid 6.4 Evacuation
7. Contingency measures	7.1 Evacuation 7.2 Isolation 7.3 Decontamination
8. "Fit to Work" records	8.1 Medical Certificate every year 8.2 Accident reports, if any 8.3 Eye vision certificate
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 stated OHS policies and safe operating procedures 1.2 followed safety signs and symbols 1.3 used personal protective equipment (PPE) 1.4 maintained workplace clear and tidy 1.5 assessed and Controlled hazards 1.6 followed emergency procedures 1.7 followed contingency measures 1.8 implemented corrective actions
2. Underpinning knowledge	2.1 Define OHS 2.2 OHS Workplace Policies and Procedures 2.3 Work Safety Procedures 2.4 Emergency Procedures 2.5 Hazard control procedure 2.6 Different types of Hazards 2.7 PPE and there uses 2.8 Personal Hygiene Practices 2.9 OHS Awareness
3. Underpinning skills	3.1 Accessing OHS policies 3.2 Handling of PPE 3.3 Handling cleaning tools and equipment 3.4 Writing report 3.5 Responding to emergency procedures

4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Sincere and honest to duties 4.3 Promptness in carrying out activities 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace
5. Resource implications	5.1 Workplace 5.2 Equipment and outfits appropriate in applying safety measures 5.3 Tools, materials and documentation required 5.4 OHS Policies and Procedures
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**GU011L4V1: Lead Small Team**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to lead small team. It specifically includes provide team leadership, assign responsibilities, set performance expectations for team members and supervise team performance.
Nominal Hours	**20 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Provide team leadership	1.1 **Work requirements** are identified and presented to team members 1.2 Reasons for instructions and requirements are communicated to team members 1.3 **Team members' queries and concerns** are recognized, discussed and dealt with
2. Assign responsibilities	2.1 Duties, and responsibilities are allocated having regard to the skills, knowledge and attitudes required to properly undertake the assigned task 2.2 Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs and according to assignment requirements 3.2 Performance expectations are based on individual team members' duties and area of responsibility 3.3 Performance expectations are discussed and directed to implement in the workplace
4. Supervise team performance	4.1 **Monitoring of performance** are taken place against defined performance criteria and / or assignment instructions and corrective action taken if required 4.2 Team members are provided **feedback**, positive support and advice on strategies to overcome any deficiencies 4.3 **Performance issues** which cannot be rectified or addressed within the team are referenced to appropriate personnel

	4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on clients' / customers' needs and satisfaction 4.5 Team operations are monitored to ensure that employer / client needs and requirements are met 4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed
Range of Variables	
Variable	**Range** (may include but are not limited to):
1. Work requirements	1.1 Client Profile 1.2 Assignment instructions
2. Team member's queries and concerns	2.1 Roster 2.2 Shift details
3. Monitoring of performance	3.1 Formal process 3.2 Informal process
4. Feedback	4.1 Formal process 4.2 Informal process 4.3 Sandwich process
5. Performance issues	5.1 Work output 5.2 Work quality 5.3 Team participation 5.4 Compliance with workplace protocols 5.5 Safety 5.6 Customer service
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 maintained or improved individuals and / or team performance given a variety of possible scenario 1.2 assessed and monitored team and individual performance against set criteria 1.3 represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf

	1.4 allocated duties and responsibilities, having regard to individual's knowledge, skills and attitude and the needs of the tasks to be performed 1.5 set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members
2. Underpinning knowledge	2.1 Company policies and procedures 2.2 Relevant legal requirements 2.3 How performance expectations are set 2.4 Methods of Monitoring Performance 2.5 Client expectations 2.6 Team members' duties and responsibilities
3. Underpinning skills	3.1 Informal performance counselling skills 3.2 Team building skills 3.3 Negotiating skills
4. Required attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and facilities appropriate to processes or activity 5.3 Materials relevant to the proposed activity 5.4 Equipment and outfits appropriate in applying safety measures 5.5 Relevant drawings, manuals, codes, standards and reference material
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated

	workplace after completion of the training module 7.2 Assessment should be done by NSDA certified assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	GU006L3V1: Apply Basic IT Skills
Nominal Hours	**20 Hours**
Unit Descriptor	This unit covers the basic knowledge, skills and attitude required to apply basic IT skills. It specifically includes Identify and use most commonly used IT Tools, operate computer, work with word processing software, use spread sheet to create /prepare worksheets, use presentation packages to create / prepare presentation, print the documents and use the internet and access E-mail.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables Training Components.
1. Identify and use most commonly used IT tools	1.1 Context of IT is interpreted 1.2 Commonly used **IT tools** are identified 1.3 Safe work practice and OSH Standards are followed
2. Operate computer	2.1 **Peripherals** are checked and connected with computer as per standard 2.2 Power cords / adapter are connected with computer and power outlets socket safely 2.3 Computer is switched on gently 2.4 PC **desktop / GUI settings** are arranged and customized as per requirement 2.5 Files and folders are created, opened, copied, renamed, deleted and sorted as per requirement 2.6 Properties of files and folders are viewed and searched 2.7 Disks are defragmented, formatted as per requirement
3. Work with word processing software	3.1 Word Processing software is selected and started 3.2 Basic typing technique is demonstrated 3.3 **Documents** are created as per requirement in personal use and office environment 3.4 **Contents** are entered 3.5 Documents are **formatted**
4. Use spread sheet to create /prepare worksheets	4.1 Spreadsheet are selected and started 4.2 Worksheets are created as per requirement in Personal use and office environment 4.3 Data are entered

	4.4 **Functions** are used for calculating and editing logical operation 4.5 Sheets are formatted as per requirement 4.6 Charts are created 4.7 Charts/ Sheets are previewed
5. Use presentation packages to create / prepare presentation	5.1 Appropriate presentation software packages are selected and started 5.2 Presentation is created as per requirement in personal use and office environment 5.3 Image, Illustrations, text, table, symbols and media are entered as per requirements 5.4 Presentations are formatted and animated 5.5 Presentations are previewed
6. Print the documents	6.1 Printer is connected with computer and power outlet properly 6.2 Power is switched on at both the power outlet and printer 6.3 Printer is installed and added 6.4 Correct printer settings are selected and document is printed
7. Use the Internet and Access E-Mail	7.1 Appropriate internet **browsers** are selected 7.2 Search engines are used to access information 7.3 Video / Information are Shared /downloaded / uploaded from / to web site/social media 7.4 Web based resources are used 7.5 Email services are identified and selected to create a new email address 7.6 Document is prepared, attached and sent to different types of recipients 7.7 Email is read, forwarded, replied and deleted as per requirement 7.8 Custom email folders are created and manipulated 7.9 Email message is printed
Range of Variables	
Variable	**Range** (may include but not limited to):
1. IT tools	1.1 Phone 1.2 Cell Phone 1.3 TABs 1.4 Radio 1.5 Television 1.6 Computers 1.7 Laptops 1.8 Notebooks

	1.9 Internet 1.10 Software 1.11 Satellite
2. Peripherals	2.1. Monitor 2.2. Keyboard 2.3. Mouse 2.4. Modem 2.5. Scanner 2.6. Printer
3. Desktop / GUI settings	3.1 Icons 3.2 Taskbar 3.3 View 3.4 Resolutions
4. Documents	4.1 Word documents 4.2 Standard CV / Bio-Data with different text & fonts, image and table. 4.3 Application / Official letter with proper paragraph and indenting, spacing, styles, Illustrations, Tables, Header & Footers and symbols. 4.4 Standard report / newspaper items with column, footnote and endnote, drop cap, indexing and page numbering.
5. Contents	5.1 Illustrations and styles 5.2 Text 5.3 Table 5.4 Symbols 5.5 Header & Footer
6. Formatted	6.1 Bold 6.2 Italic 6.3 Underline 6.4 Font size, colour, 6.5 Change case 6.6 Alignment and intend
7. Functions	7.1. Mathematics 7.2. Logical 7.3. Simple Statistical
8. Browsers	8.1 Internet Explorer 8.2 Firefox 8.3 Google Chrome 8.4 Opera 8.5 Safari 8.6 Omni Web
Evidence Guide	

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 created, opened, copied, renamed, deleted and sorted files and folders as per requirement. 1.2 completed application software Installations as per standard 1.3 performed simple trouble shooting with Computer 1.4 created email accounts. 1.5 used email account for online platforms purpose
2. Underpinning Knowledge	2.1 Basic competent of PC 2.2 IT and IT Tools 2.3 Different type of software and application packages 2.4 Use of word processor, spread sheet and presentation software 2.5 Different type of math and logical functions 2.6 Computer Trouble Shooting 2.7 Techniques to access internet
3. Underpinning Skills	3.1 Identifying and use IT Tools 3.2 Demonstrating typing on word processing software 3.3 Saving and retrieving documents on Word Processing software. 3.4 Demonstrated ability to create email accounts 3.5 Opening an email account and use it for different purpose. 3.6 Configured appropriate printer settings and printed the document
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace (simulated or actual) 5.2 IT Tools 5.3 Computers with word processing application 5.4 Internet connection 5.5 Presentations 5.6 Learning manuals
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test

	6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Sector Specific Competencies

Unit Code and Title	SULE001L2V1: Interpret Manuals, Sketches and Drawings
Nominal Hours	**15 hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to interpret manuals, sketches and drawings. It specifically includes interpret information and specifications, workplace documents, read and interpret sketches and drawings and practice professional ethics at workplace.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Interpret information and specifications	1.1 Appropriate **manuals** for work activity are identified andcollected 1.2 Information and specifications in the manuals are interpretedand applied
2. Interpret workplace documents	2.1 Workplace documents are interpreted as per standard 2.2 Assistance is taken to aid comprehension when required from peers / supervisors 2.3 Visual information / symbols / signage's are understood and followed 2.4 Specific and relevant information are accessed from appropriate sources 2.5 Appropriate medium is used to transfer information and ideas
3. Read and interpret sketches and drawings	3.1 Relevant **sketches and drawings** are identified for jobrequirement 3.2 Key terms and abbreviations are identified and interpreted 3.3 Signs and symbols are identified and interpreted 3.4 Schedules, dimensions, sketches, drawings and specificationsare correctly read and interpreted
4. Practice professional ethics at workplace	4.1 Responsibilities as a team member are demonstrated and kept promises and commitments made to others 4.2 Tasks are performed in accordance with workplace procedures 4.3 Confidentiality is respected and maintained 4.4 Situations and actions considered inappropriate or which present a conflict of interest are avoided
Range of Variables	

Variable	**Range** (may include but not limited to):
1. Manuals	1.1. Buyers' specification 1.2. Compliance 1.3. Maintenance procedure 1.4. Periodic maintenance 1.5. Quality assurance 1.6. Standard operating procedure (SOP)
2. Sketches and drawings	2.1. Technical 2.2. Measurement 2.3. Design
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 identified information and specifications 1.2 read and interpreted sketches and drawings
2. Underpinning knowledge	2.1. Describe Manuals 2.2. Types of manuals 2.3. Units of measurement 2.4. Units of conversion 2.5. Signs and symbols 2.6. Define Sketch 2.7. Define drawings 2.8. Define specifications
3. Underpinning Skills	3.1 Interpreting performance of workplace communication and etiquette 3.2 Interpreting workplace instructions and symbol 3.3 Interpreting workplace code of conducts is as per organizational guidelines 3.4 Interpreting workplace documents as per standard 3.5 Interpreting and implementing meeting outcomes
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Computer/laptop/notebook

	5.3. Software 5.4. Stationary 5.5. Learning manual 5.6. Fire extinguisher
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	SULE002L2V1: Apply Quality System
Nominal Hours	**15 Hours**
Unit Descriptor	This unit covers the knowledge, skills, and attitudes required to apply quality system. It specifically includes the tasks of work within a quality system, apply and monitor quality system improvement, and the apply standard procedures to each job.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Work within a quality system	1.1. Instructions and procedures are strictly followed following the **quality improvement system** 1.2. Duties are performed following the demand of the quality improvement system 1.3. Defects are detected and reported according to standard operating procedures 1.4. Quality service is ensured and delivered to the customer in providing a product or service
2. Apply and monitor quality system improvement	2.1. Performance measurement systems are identified 2.2. Specifications and standard operating procedures are identified and established 2.3. Performance is assessed at regular intervals 2.4. Defects are detected and reported to authority according to standard operating procedure 2.5. Process improvement procedures are contributed to and implemented 2.6. Improvement of internal/external customer and supplier relationships is contributed to 2.7. Performance of operation or quality of product or service is monitored to ensure customer satisfaction
3. Apply standard procedures for each job	3.1. The concept of supplying a product or service to meet the customer's requirements is understood and applied accordingly 3.2. Responsibility is taken for the quality of own work 3.3. Quality system procedures for each job are followed 3.4. Conformance to specification is ensured in every case at all situations
Range of Variables	

Variable	**Range** (may include but not limited to):
1. Quality improvement system	1.1. Quality inspection 1.2. Quality control 1.3. Quality improvement 1.4. Total quality control 1.5. Quality assurance
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 used personal protective equipment (PPE) 1.2 maintained proper specification and standard of product 1.3 checked product for quality assurance as per drawing and specification 1.4 detected defects and take corrective and/or quality improvement actions 1.5 ensured customer satisfaction
2. Underpinning knowledge	2.1 Quality improvement systems 2.2 Common defects and procedures for addressing defects 2.3 Performance measurement systems 2.4 The implementation process of quality improvement system
3. Underpinning Skills	3.1 Identifying the role of self and others within the equality improvement system 3.2 Identifying product and process specifications and tolerance limits 3.3 Detecting defects, taking corrective and/or quality improvement action 3.4 Keeping records following standard operating procedure 3.5 Identifying customer requirements and always meeting those requirements
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace

	4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Hand tools 5.4. Power tools 5.5. Measuring tools 5.6. Projector 5.7. Stationary 5.8. Learning manual
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

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Occupation Specific Competencies

Unit Code and Title	**OUPLC01L4V1: Execute Sequential Control Using Relay Logic**
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills, and attitudes required to executing sequential control using relay logic. It specifically includes the tasks of interpret mechanical switching operation, perform mechanical switching operation, execute timer and counter application, and construct latch, DOL and star delta.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables
1. Interpret mechanical switching operation	1.1 The coil of the mechanical relay and magnetic contact are identified 1.2 Appropriate power for relay & contacts coil are supplied 1.3 Standard **symbol & numbers** of contacts are identified
2. Perform mechanical switching operation	2.1. Safe working practices observed and Personal Proactive Equipment (PPE) is worn as per workplace requirement 2.2. The relay coil using a switch, power supply & indicator are connected 2.3. The **contact status** is checked using multimeter 2.4. Latch circuit using relay is constructed 2.5. **Boolean logic** operation using relay is executed 2.6. Start and Stop operations are executed
3. Execute timer and counter application	3.1. The function, application & wiring of **timer** is identified 3.2. The preset value, count value of **counter** is identified 3.3. Timer and counter application are executed
4. Construct latch, DOL and star delta	4.1 Direct online (DOL) circuit is constructed 4.2 Reverse-forward rotation of a three-phase induction motor is performed 4.3 Star-delta starter circuit is constructed 4.4 Disadvantages of star-delta startup are identified
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Symbols & numbers	1.1 Basic symbols of normally open/ normally close contact 1.2 Contact identification number

2. Contact status	2.1 Normally Open (NO) 2.2 Normally Close (NC)
3. Boolean logic	3.1 AND 3.2 OR 3.3 NAND 3.4 NOR 3.5 XOR 3.6 XNOR
4. Timer	4.1 On-delay timer 4.2 Off-delay timer
5. Counter	5.1 Up counter 5.2 Down counter

Evidence Guide

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the unit of competency

1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 carried out latch circuit 1.2 constructed boolean operation circuit 1.3 identified contact coil & contacts 1.4 constructed direct online circuit 1.5 constructed star delta circuit 1.6 performed counter application using preset counter
2. Underpinning knowledge	2.1 Basic relay logic operation. 2.2 Basic relay control system. 2.3 Basic time delay operation. 2.4 Basic counting applications
3. Underpinning Skills	3.1 Connecting relay & magnetic contact in accordance specified standard. 3.2 Executing direct online circuit. 3.3 Executing star delta circuit.
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implication	The following resources must be provided: 5.1 Relevant tools, Equipment, software and facilities needed to perform the activities.

	5.2 Required learning materials.
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning
7. Context of Assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

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Unit Code and Title	**OUPLC02L4V1: Perform PLC Installation, Wiring and Configuring**
Nominal Hours	**70 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform PLC installation, wiring and configuring. It specifically includes-prepare for work, setup PLC hardware configurations with software tool and setup communication between PLC and PC.
Elements of Competency	**Performance Criteria** **Bold and Underlines** terms are elaborated in the range of variables
1. Prepare for works	1.1 Safe working practices observed and Personal Proactive Equipment (PPE) is worn as per workplace requirement 1.2 Necessary tools and equipment are selected and prepared for Installation as job requirements 1.3 Materials and PLC components are identified required for Installation and commissioning of PLC
2. Setup PLC hardware configurations with software tool	2.1. Typical **PLC hardware components** and the control devices are installed as per job requirement 2.2. Sensors and switches are connected to a particular input and output of PLC 2.3. **Cable connections** between the PLC and the machine are connected as per work instruction 2.4. Connection is checked as per required specification 2.5. **Protective devices** are set as per the user manual 2.6. Required software tool is installed 2.7. Selected hardware is configured using PLC **software tools**
3. Setup communication between PLC and PC	3.1. Hardware devices are checked in accordance with user manual 3.2. Address of PLC and PC are configured as per job requirement 3.3. Communication between PLC and PC using **communication protocols** is established 3.4. Communication between PLC & PC is verified
Range of Variables	
Variable	**Range** (May include but not limited to)
1. PLC hardware components	1.1 Power supply module 1.2 Input/ output module 1.3 Mounting accessories

	1.4 CPU unit 1.5 Communication module 1.6 Programming device 1.7 Front connector
2. Cable connections	2.1. RS 232 2.2. USB 2.3. Ethernet 2.4. RS485 2.5. RS422 2.6. Profibus
3. Protective devices	3.1. Fuse 3.2. Miniature Circuit Breaker (MCB) 3.3. 24V DC supply unit 3.4. Grounding unit
4. Software tool	4.1. TIA Portal 4.2. GX Works 4.3. RSLOGIX 4.4. LSXG5000 4.5. Fanuc ladder 4.6. WPLSoft
5. Communication protocols	5.1 Profinet 5.2 Profibus 5.3 USB 5.4 Modbus
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the unit of competency.	
1. Critical aspects of competency	Assessment must evidence that the candidate: 1.1 configured PLC hardware 1.2 established communication PLC and PC 1.3 programmed using IEC stranded language 1.4 downloaded and verified the program
2. Underpinning knowledge	2.1. Basic computer operation 2.2. Common software packages 2.3. PLC hardware configuration 2.4. PLC communication 2.5. PLC programming 2.6. Software maintenance and virus protection
3. Underpinning skill	3.1. Upload download and program backup. 3.2. Parameter setting 3.3. Programming

4. Required attitude	4.1 Tidy and punctual 4.2 Prompt in carrying out activities 4.3 Sincere and honest concerning duties 4.4 Active on teamwork 4.5 Eager to learn 4.6 Concerned for proper use of tools 4.7 Concerned about the work environment 4.8 Committed to occupational health and safety practices 4.9 Respectful of peers, subordinates and seniors in the workplace 4.10 Communicate with peers and seniors in the workplace 4.11 Concerned about proper use of computer and peripherals
5. Resource implication	Following resources must be provided- 5.1 Relevant Tools, Equipment and physical facilities required to perform activities 5.2 Materials and consumables are related to the activities 5.3 Relevant drawings, manuals, charts and diagrams
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Written test 6.3 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

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Unit Code and Title	**OUPLC03L4V1: Carry Out Ladder Diagram, Structured Programming and Data Block**
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to carry out ladder diagram, structured programming and data block. It specifically includes- prepare for ladder diagram, prepare basic ladder diagram, prepare for structured programming, and perform PLC programming.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the range of variables
1. Prepare for ladder diagram	1.1 Safe work practices observed and **Personal Protective Equipment (PPE)** are worn as required for the work performed 1.2 Necessary **software and hardware** are selected as job requirements 1.3 Table chart for sub-program, function, function block and data block are prepared 1.4 **Programming components** are identified required for ladder diagram of PLC
2. Prepare basic ladder diagram	2.1. Rung are selected in accordance with the instruction manuals 2.2. Ladder diagram is performed using different types of sub-program as per the user requirement 2.3. Offline simulation is performed to observe functionality 2.4. Online simulation is performed to observe functionality
3. Prepare for structured programming	3.1. Structured programming is performed 3.2. Function & Function block is programmed 3.3. Data block for structured programming is used 3.4. Local variable, Global variable are identified 3.5. Application of program is performed 3.6. IEC standard programming is performed
4. Perform PLC Programming	4.1. Programming devices are identified 4.2. **PLC program** required by specific application is developed 4.3. PLC Program is imported from memory card 4.4. PLC Program is compiled with diagnosis 4.5. Programs are transferred to PLC and set the PLC in Run Mode

	4.6. Optimization of software is done to ensure the program after the first test run. 4.7. Final circuit testing and optimization is done to ensure no errors occur by the entire system.
Range of Variables	
Variable	**Range** (May include but not limited to)
1. Personal Protective Equipment (PPE)	1.1 Apron / overall 1.2 Goggles 1.3 Insulated Gloves 1.4 Insulated shoe
2. Software and hardware	2.1. Input module 2.2. Output module 2.3. PLC CPU 2.4. Communication cable 2.5. Programming cable 2.6. Software as per hardware of PLC
3. Programming components	3.1. Make contact 3.2. Break contact 3.3. Analog contact 3.4. Relay coil 3.5. Inverted Output 3.6. Analog output 3.7. All types of timers 3.8. Counter
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 followed Occupational Safety and Health (OSH) 1.2 identified control devices 1.3 identified programing tools 1.4 performed communication between PC and PLC 1.5 checked PLC input and output 1.6 performed ladder diagram for different control system
2. Underpinning knowledge	2.1. Ladder diagram and its usability 2.2. Principles and operation of digital & analogue control system 2.3. Principle of operation for sensors 2.4. Function & function block 2.5. Data block 2.6. Single instance and multi-instance data block

	2.7. Shared data block
3. Underpinning skills	3.1. Performing basic computer operation. 3.2. Communicating PC with PLC. 3.3. Connecting I / P, O / P and peripheral devices. 3.4. Using techniques of Timer, counter, relay & contact for programming. 3.5. Identifying system faults of Programming. 3.6. Identifying communication fault of Programming.
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers, sub-ordinates and seniors in workplace
5. Resource implication	5.1 Relevant Tools, Equipment and physical facilities required to perform activities 5.2 Materials and consumables are related to the activities 5.3 Relevant manuals
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

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Unit Code and Title	**OUPLC04L4V1: Apply PLC for Pneumatic and Hydraulic Control System Application**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to applying PLC for pneumatic and hydraulic control system application. It specifically includes- perform different control applications in pneumatics and perform different control applications in hydraulics.
Nominal Hours	**50 Hours**
Elements of Competency	**Performance Criteria** **<u>Bold & Underlined</u>** terms are elaborated in the Range of Variables
1. Perform different control applications in pneumatics	1.1 **<u>Valve sequencing</u>** are performed using PLC 1.2 Two-step control system are executed to control pressure 1.3 Three-step control system are executed to control pressure 1.4 PLC for application of electro-pneumatic circuit is programmed and performed
2. Perform different control applications in hydraulics	2.1. Valve sequencing are performed using PLC 2.2. Two-step control system are executed to control pressure 2.3. Three-step control system are executed to control pressure 2.4. PLC for application of electro-hydraulic circuit is programmed and performed
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Valve sequencing	1.1 Double Cylinder operation 1.1.1 A+ B+ : A- B- 1.1.2 A+B+ : B- A- 1.1.3 A+A- : B+ B- 1.2 Lifting device
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 conducted connections of control device with peripheral equipment 1.2 identified field and control devices 1.3 followed typical spacing and grounding 1.4 set zero factor

	1.5 optimized software 1.6 checked hardware, circuit, wiring, input and output system 1.7 identified programming tools 1.8 performed communication between PC and PLC 1.9 checked PLC input and output 1.10 performed ladder diagram for different control system
2. Underpinning knowledge	2.1 Principles and operation of digital& analogue control system 2.2 Function of Programmable Logic Controller (PLC) 2.3 Hardware & Software of PLC 2.4 PLC wiring principle 2.5 Function of inverter and starter 2.6 Acknowledge All type of Proximity sensor 2.7 All type of output relays 2.8 Ladder diagram and its usability 2.9 Principles and operation of Digital & Analogue control system 2.10 Function of Programmable Logic Controller (PLC) 2.11 Acknowledge Hardware & Software of PLC 2.12 Function all control device 2.13 Symbol of Input / output devices and components 2.14 Principle of operation for sensors. 2.15 Symbol and function of relays 2.16 Features of control devices 2.17 Types of contact, relay, timer, counter, and supporting option for programming
3. Underpinning skills	3.1 Assembling and disassembling of control devices 3.2 Connecting devices with power supply 3.3 Handling materials, control devices 3.4 Connecting I / P, O / P and peripheral devices 3.5 Applying techniques of checking and testing circuit and peripheral devices 3.6 Setting parameter 3.7 Uploading and downloading software 3.8 Maintaining tools and equipment 3.9 Performing basic computer operation 3.10 Communicating PC with PLC 3.11 Connecting I / P, O / P and peripheral devices 3.12 Using techniques of Timer, counter, relay & contact for programming 3.13 Identifying system faults of Programming 3.14 Identifying communication fault of Programming

4. Required attitudes	4.1 Tidy and punctual 4.2 Prompt in carrying out activities 4.3 Sincere and honest concerning duties 4.4 Active on teamwork 4.5 Eager to learn 4.6 Concerned for proper use of tools 4.7 Concerned about the work environment 4.8 Committed to occupational health and safety practices 4.9 Respectful of peers, subordinates and seniors in the workplace 4.10 Communicate with peers and seniors in the workplace 4.11 Concerned about proper use of computer and peripherals
5. Resource implications	The following resources must be provided: 5.1 Workplace (simulated or actual) 5.2 Computer/laptop/notebook 5.3 Software 5.4 Internet 5.5 Sample part/model 5.6 Job specifications, drawings or work instructions 5.7 Projector 5.8 Stationary 5.9 Learning manual
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

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Unit Code and Title	**OUPLC05L4V1: Apply PLC Based Basic Control System**
Nominal Hours	**45 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to applying PLC based basic control system. It specifically includes-perform different types of control system, perform two step and multistep controllers, perform PID controls, interpret the tunning PID controller to stabilize the system, apply open loop control system, and apply close loop control system.
Elements of Competency	**Performance Criteria** **Bold and underlined** terms are elaborated in the range of variables
1. Perform different types of control system	1.1 Open loop control system is identified 1.2 Close loop control system is identified
2. Perform two step and multistep controllers	2.1 Two step controllers are implemented 2.2 Multi-step controller is implemented 2.3 Steady state error of two step controllers is identified 2.4 **Process variable** is identified 2.5 Effect of system size & properties are identified 2.6 Two-step control system form chattering is protected 2.7 Tolerance value is calculated and recorded
3. Perform PID controls	3.1 P controller is performed 3.2 I controller is performed 3.3 PD controller is performed 3.4 PI controller is performed 3.5 PID controller is performed
4. Interpret the tunning PID controller to stabilize the system	4.1 Maximum gradient is identified 4.2 Lag is identified 4.3 Settling time is identified 4.4 Ultimate gain & oscillation period are identified 4.5 **Controller tunning** are interpreted
5. Apply open loop control system	5.1 Temperature is controlled & checked by temperature Gauge 5.2 Pressure is controlled & checked by pressure gauge 5.3 Frequency is controlled & motor RPM checked by Tachometer
6. Apply close loop control system	5.4 Temperature is controlled using two-step controller 5.5 Pressure is controlled using **PID controller** 5.6 Accuracy level of a close loop controller is checked
Range of Variables	

Variable	**Range** (May include but not limited to)
1. Process variable	1.1 Temperature 1.2 Flow 1.3 Level 1.4 Pressure
2. Controller tunning	2.1. Kp Proportional gain 2.2. Ki Integral gain 2.3. Kd Derivative gain
3. PID controller	3.1 Proportional controller 3.2 Integral Controller 3.3 Derivative Controller
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	The assessment required evidence that the candidate: 1.1 controlled temperature checked using temperature gauge 1.2 controlled pressure checked using pressure gauge 1.3 controlled frequency and checked rpm using tachometer 1.4 controlled pressure using two step controllers. 1.5 controlled pressure using PID controllers. 1.6 identified difference between two step & PID controllers. 1.7 tuned PID controllers
2. Underpinning knowledge	2.1 Principles & operation of electronic control system 2.2 Open loop & close loop control. 2.3 Two step & multistep control. 2.4 Continuous control. 2.5 Proportional, derivative, integral gain
3. Underpinning skill	3.1 Controlling temperature using two step controllers. 3.2 Controlling temperature using multi step controllers. 3.3 Controlling pressure using two step controllers. 3.4 Controlling pressure using PID controllers 3.5 Tunning PID controllers
4. Required attitude	4.1 Commitment to occupational safety & health 4.2 Promptness in carrying out activities 4.3 Tidiness & timeliness 4.4 Eagerness to learn 4.5 Sincere & honest to duty 4.6 Environmental concerns 4.7 Respect to rights of peers & seniors at workplace 4.8 Communication with peers & seniors in workplace
5. Resource implication	Following resources must be provided- 5.1 Workplace (actual & simulation) 5.2 Equipment relevant to proposed activities

	5.3 Tools, materials & documentations 5.4 Specification or work instructions
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

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Unit Code and Title	OUPLC06L4V1: Perform Process Visualization (HMI)
Nominal Hours	**50 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to performing process visualization (HMI). It specifically includes- configure human machine interface (HMI) panel integration and visualize the process.
Elements of Competency	**Performance Criteria** **Bold and underlined** terms are elaborated in the range of variables
1. Configure human machine interface (HMI) panel integration	1.1 HMI is configured to integrate with PLC 1.2 Different HMI communication are established with PLC 1.3 Different screens are created and selected with soft buttons 1.4 Basic objects are created and configured 1.5 Basic elements are created and configured 1.6 Graphic objects are imported from library 1.7 **Analogue data tag** is configured
2. Visualize the process	2.1. Hardware is configured and set for downloading mode 2.2. Communications and address are set 2.3. Tag connections are established between PLC and HMI 2.4. Input output tags are created for animation and different types of events 2.5. **Basic objects** are animated 2.6. Bar scales are configured for minimal and maximum values 2.7. Basic **analogue I/O fields** are configured for input and output values 2.8. Graphic views are animated 2.9. Text messages are visualized and animated 2.10. **I/O fields** are addressed 2.11. Alarm recipes are performed 2.12. Historical data is analysed 2.13. Work with data saving is executed 2.14. Trend data is performed
Range of Variables	
Variable	**Range** (May include but not limited to)
1. Analogue data tags	1.1 Analogue I/O fields 1.2 Analogue bar 1.3 Trends 1.4 Analogue gauge

2. Basic objects	2.1 Line 2.2 Circle 2.3 Rectangle 2.4 Text
3. Analogue I/O fields	3.1. Bar 3.2. Analogue input / output field
4. I/O fields	4.1 Appearance 4.2 Limit 4.3 Animation 4.4 Event

Evidence Guide

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.

1. Critical aspects of competency	The assessment required evidence that the candidate: 1.1 configured and integrated HMI with PLC 1.2 established HMI communication with PLC 1.3 created and configured screens, objects and elements 1.4 imported graphic objects from library 1.5 configured data tag
2. Underpinning knowledge	2.1 Principles & operation of electronic control system 2.2 Open loop & close loop control 2.3 Two step & multistep control 2.4 Continuous control 2.5 Proportional, derivative, integral gain
3. Underpinning skill	3.1 Controlling temperature using two step controllers. 3.2 Controlling temperature using multi step controllers. 3.3 Controlling pressure using two step controllers. 3.4 Controlling pressure using PID controllers 3.5 Tunning PID controllers.
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Workplace (actual & simulation) 5.2 Equipment relevant to proposed activities 5.3 Tools, materials & documentations

	5.4 Specification or work instructions
6. Methods of assessment	6.1 Demonstration 6.2 Oral questioning 6.3 Written test
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

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Development of Competency Standard

The Competency Standards for National Skills Certificate in Programmable Logic Controller (PLC), Level-4 is developed by NSDA.

List of Members

1.	Dr. Abu Nahian, Project Engineer, Control & Simulation and WMG, System Engineering Limited.	Member
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9.	Mr. Faruk Hannan, Director & CEO, 3D print BD	Member

Validation of Competency Standard by Standard and Curriculum Validation Committee (SCVC)

The Competency Standards for National Skills Certificate in Programmable Logic Controller (PLC), Level-4 is validated by NSDA on 20 - 21 March 2022.

List of Members

1.	Mr. Ashraf Ibn Nur, Vice-Chairman, LEISC.	Chairperson
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This Competency Standard for **Programmable Logic Controller (PLC)** is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

This document has been developed by NSDA in association with **Light Engineering Sector**, industry representatives, academia, related specialist, trainer and related employee.

Public and private institutions may use the information contained in this standard for activities benefitting Bangladesh.