

INSTALL AND MAINTAIN PROGRAMMABLE LOGIC CONTROLLERS

UNIT CODE: 0714 551 17A

TVET CDACC UNIT CODE: ENG/OS/IA/CR/02/6/MA

UNIT DESCRIPTION

This unit covers the competencies required in installation and maintenance of programmable logic controller according to design and installation considerations for Programmable Logic Controller systems (PLC) based control systems. It puts into consideration conducting site survey, developing PLC programs, planning programmable logic controllers' installation, installing planning programmable logic controllers and maintaining programmable logic controllers

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. <i>Bold and italicized terms are elaborated in the Range</i>
1. Conduct Programmable Logic Controllers site survey	1.1. Programmable Logic Controllers <i>site survey aspects</i> are identified as per work requirement 1.2. Programmable Logic Controllers <i>site survey tools and equipment</i> are assembled as per work requirement 1.3. Programmable Logic Controllers site survey is carried out as per work requirement 1.4. Site survey report is generated as per workplace procedures
2. Develop PLC programs	2.1. <i>Programmable logic controller system requirements</i> are identified as per work requirements 2.2. <i>PLC programming language</i> is selected as per work requirement 2.3. PLC code is developed as per work requirement 2.4. PLC code is tested and debugged as per work requirement
3. Plan Programmable Logic Controllers installation	3.1. Programmable Logic Controllers system is designed as per installation layout 3.2. Programmable Logic Controllers installation workplan is prepared as per work requirements 3.3. Programmable Logic Controller <i>system supplies</i> are assembled as per work requirement
4. Install Programmable Logic Controllers	4.1. <i>PPE</i> are donned as per work requirement 4.2. Programmable Logic Controllers <i>structured wiring</i> is done as per installation layout 4.3. <i>Programmable Logic Controllers system accessories and equipment</i> are mounted as per installation layout 4.4. Programmable Logic Controller system wires are terminated as per work requirement

	4.5. Programmable Logic Controller system tests are carried out as per work requirements 4.6. PLC controlled process is calibrated as per work requirement 4.7. Programmable Logic Controllers installation site housekeeping is carried out as per workplace procedures 4.8. Programmable Logic Controllers site waste is disposed as per work requirement
5. Maintain Programmable Logic Controllers	5.1. Programmable Logic Controllers maintenance schedule is prepared as per workplace procedures 5.2. PPE are donned as per work requirement 5.3. Programmable Logic Controllers maintenance tools, equipment and spares are assembled as per work requirement 5.4. Programmable Logic Controllers maintenance tasks are carried out as per work requirement 5.5. Maintenance reports are prepared as per workplace procedures

RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

Variable	Range
1. Site survey aspects include but not limited to:	• Power requirement analysis • User requirements • Electrical protection requirements • Environmental considerations • Cable routes • Instrumentation systems • Compatibility with existing systems • Scalability • Cost
2. Site survey tools and equipment include but not limited to:	• Tools ▪ Tape measure ▪ Laser meter ▪ Camera ▪ Multimeter ▪ Stationery ▪ Infrared thermometer ▪ Cable tracer ▪ Ladder ▪ Flashlight

	• Equipment ▪ Power analyzer ▪ Megohmmeter
3. Programmable logic controller system requirements include but not limited to:	• PLC programming software • PLC programming hardware • Input and output interface • Communication interface
4. PLC programming language include but not limited to:	• Ladder • Functional block diagram • Structured text language
5. system supplies include but not limited to:	• Cables • Protection devices and switchgear • Distribution board • Enclosures • Rails • Programmable logic controllers • Electrical tools and equipment • Connectors and terminals • Trunking • Raceways • Fasteners
6. PPE includes but not limited to:	• Helmet • Hand gloves • Safety shoes • Harness • Safety goggles
7. structured wiring includes but not limited to:	• creating wire route • laying wires • labelling wires
8. Programmable Logic Controllers system accessories include but not limited to:	• Memory modules • Expansion modules • Communication adapters • Input and output modules • Human machine interfaces • Sensors and transducers • Programmable logic controllers

	• Power supplies • Mounting hardware • Enclosures • Surge protectors • Terminal blocks • Interlocks • Safety relays
9. <i>Programmable Logic Controllers equipment</i> includes but not limited to:	• Field devices • Power supplies • Enclosures and Racks • Signal conditioners • Human machine interface panels • Safety devices
10. <i>Programmable Logic Controller system tests</i> include but not limited to:	• Functionality test • Electrical continuity test • Electrical resistance test
11. <i>site waste</i> includes but not limited to:	• Packaging material • Stripped cable insulation • Faulty components and equipment
12. <i>maintenance tools, equipment and spares</i> include but not limited to:	• Tools ▪ Multimeters ▪ Clamp meters ▪ Hand tools ▪ Thermometer • Equipment ▪ Personal computer ▪ Signal generators ▪ Blower • Spares ▪ Circuit breakers ▪ Programmable logic controllers ▪ HMI ▪ Switches ▪ Relays ▪ Power supplies ▪ Interface cards

13. <i>maintenance tasks</i> include but not limited to:	• Inspection • Testing and measurements • Cleaning • Tightening • Replacing faulty component • PLC program backup
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REQUIRED KNOWLEDGE AND SKILLS

This section describes the knowledge and skills required for this unit of competency.

Required knowledge

The individual needs to apply knowledge of:

- Occupational Health and safety
- Electrical wiring systems
- IEC regulations
- Electrical Testing and measuring tools
- Electrical workshop practices
- Documentation and records keeping
- Electrical power backup systems
- Interpreting technical documentation
- PLC programming
- Sensors and transducers
- Instrumentation systems

Required Skills

The individual needs to apply the following skills:

- Structured industrial wiring
- Electrical Troubleshooting
- Problem solving
- Technical reporting
- Communication skills
- Digital skills
- Time management
- Decision making
- Critical thinking

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge, skills and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1. Carried out Programmable Logic Controllers site survey as per work requirement 1.2. Generated site survey report is generated as per workplace procedures
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	1.3. Identified Programmable logic controller system requirements as per work requirements 1.4. Developed PLC code as per work requirement 1.5. Designed programmable logic controller system as per work requirements 1.6. Assembled Programmable Logic Controllers supplies as per work requirement 1.7. Donned PPE as per work requirement 1.8. Did Programmable Logic Controllers structured wiring as per installation layout 1.9. Mounted Programmable Logic Controllers system accessories and equipment as per installation layout 1.10. Terminated Programmable Logic Controller systems wires as per work requirement 1.11. Carried out Programmable Logic Controllers tests as per work requirements 1.12. Calibrated PLC controlled process as per work requirement 1.13. Carried out Programmable Logic Controllers maintenance tasks are carried out as per work requirement
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Resources appropriate for performance of assessment tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Project 3.2 Practical 3.3 Third party report 3.4 Portfolio of evidence 3.5 Written tests 3.6 Oral questioning
4. Context of Assessment	This competency may be assessed in a workplace or in a simulated workplace.
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.