NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

FEBRUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHATRONICS TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

CCD	Control Circuit Diagram
CAD	Computer-aided Design
CBET	Competency Based Education and Training
DDM	Digital Multimeter
EF	Electromechanical Equipment
HC	Hydraulic Circuit
I/O	Input/Output
LED	Light Emitting Diode
MDI	Manual Data Input
MOPP	Maintenance Operation Processes and Procedures
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PC	Personal computer
PID	Proportional-Integral-Derivative
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
SFC	Sequential Function Diagram
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

UM	Micrometer

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to the demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Mechatronics Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Mechatronics Technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of ... online surveys were completed by experts from the labour market across the country. Apart from the surveys aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MECHATRONICS TECHNICIANS

These standards cover a broad range of duties and tasks that can be performed by a Mechatronics Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the

technician in specific settings or positions. The Mechatronics Engineer may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mechatronics Technicians work under the supervision of engineers. They can install simple circuits, prepare the preliminary work of mechanical parts processing, process simple mechanical parts, operate and maintain electromechanical equipment, install electromechanical equipment, debug electromechanical equipment, operate and maintain numerical control equipment, install, change and debug automatic production lines, analyse and correct faults with electromechanical equipment, and engage in electromechanical equipment sales activities.

Generally, the Mechatronics Technician performs the following responsibilities:

a) Simple part machining

b) Machining preparation of mechanical parts

c) Simple machining of mechanical parts

d) Operation and maintenance of electromechanical equipment

e) Installation of electromechanical equipment

f) Debugging of electromechanical equipment

g) Operation and maintenance of NC machining equipment

h) Installation and debugging of automatic production line

i) Operation and maintenance of electromechanical equipment

j) Sales of electromechanical equipment

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR MECHATRONICS TECHNICIAN – NTA 5

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	OPERATION AND MAINTENANCE OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	501
TASK TITLE	OPERATION OF ELECTROMECHANICAL EQUIPMENT	**TASK NO.**	5011
PERFORMANCE CRITERIA	The person performing this task must be able to operate electromechanical equipment in accordance with technical requirements and the user's manual of the equipment.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Lathe; 2. Tool; 3. Measuring tool; 4. Chuck wrench, tool holder wrench and adjustable wrench; 5. Goggles, work clothes and protective shoes; 6. Materials: 45# steel 7. Wastebin; 8. Magnetic cleaning vehicle of iron filings; 9. Shelf; 10. Tool cabinet.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the safety operation regulations of the equipment; 2. Choose tools and equipment such as fixtures and cutters; 3. Read product processing drawings; 4. Develop processing technology; 5. Clamp blanks and tools; 6. Debug the positions of fixtures and tools; 7. Carry out product processing; 8. Conduct the spot check of processed finished products; 9. Organize tools and clean the equipment site.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable processing tools and equipment; 1.2 Read product processing drawings; 1.3 Clamp and debug blanks, tools, fixtures, etc.; 1.4 Process products; 1.5 Detect the product quality. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Working principle of lathes; 2.2 Principle of dimensional accuracy control. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Machining steps of NC lathes; 3.2 Installation of tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Electromechanical equipment can ne operated in accordance with technical requirements and the user's manual of the equipment.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of lathes; 2. Safe use of tools and measuring tools; 3. Daily maintenance methods of equipment and measuring tools; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	OPERATION AND MAINTENANCE OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	501
TASK TITLE	ROUTINE MAINTENANCE OF ELECTROMECHANICAL EQUIPMENT	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to perform routine maintenance of electromechanical equipment in accordance with technical requirements and the equipment maintenance manual.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Lathe; 2. Tool; 3. Measuring tool; 4. Chuck wrench, tool holder wrench, adjustable wrench, inner hexagon wrench, screwdriver; 5. Multimeter; 6. Oil can; 7. Level gauge; 8. Goggles, work clothes and protective shoes; 9. Cleaning supplies; 10. Air pump.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for safety during working; 2. Disconnect or turn on the power supply; 3. Select appropriate tools for equipment adjustment; 4. Check the levelness; 5. Add equipment lubricant; 6. Check the electrical cabinet; 7. Check the equipment cooling system; 8. Clean the tools, equipment and workplaces; 9. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the lubricating system of the mechanical part of the equipment; 1.2 Read the electrical schematic diagram of the equipment; 1.3 Adjust the equipment level. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of mechanical transmission; 2.2 Principle of electrical control; 2.3 Equipment maintenance procedures. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Maintenance methods of mechanical components; 3.2 Maintenance methods of electrical components. **4.0 Essential Skills** **4.1 Communication skills;** 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The routine maintenance of equipment is performed with electromechanical maintenance records filled in a standard manner according to equipment maintenance requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of lathes; 2. Safe use of measuring instruments; 3. Daily maintenance methods of equipment and measuring tools 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	OPERATION AND MAINTENANCE OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	501
TASK TITLE	SIMPLE TROUBLESHOOTING OF TYPICAL ELECTROMECHANICAL EQUIPMENT	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to use commonly-used tools and instruments to find and eliminate simple faults of equipment in accordance with technical requirements and the equipment maintenance manual.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Screwdriver; 2. Diagonal pliers; 3. Needle-nose pliers; 4. Wire strippers; 5. Flat-nose pliers; 6. Hexagon wrenches; 7. Adjustable wrench; 8. Dial indicators; 9. Magnetic gauge stand; 10. Vernier caliper; 11. Electroprobe; 12. Multimeter; 13. Electrical tape; 14. Tool cabinet.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Select appropriate tools and equipment for the task; 3. Check the technical requirements of equipment; 4. Read the equipment maintenance manual; 5. Read the electrical schematic diagram; 6. Observe faults; 7. Detect fault causes; 8. Troubleshoot the equipment;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Observe faults; 1.2 Detect fault causes; 1.3 Troubleshoot the equipment; 1.4 Test equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of mechanical equipment transmission; 2.2 Principle of electrical control; 2.3 Principle of equipment fault analysis;

9. Test whether the equipment is restored; 10. Clean the tools, equipment and workplaces; 11. Safely arrange and store the tools and equipment.	2.4 Principles of operation specifications for troubleshooting. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Method of determining the fault cause; 3.2 Troubleshooting method. **4.0 Essential Skills** 4.1 Skills to read and understand technical drawings; 4.2 Communication skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Fault cause analysis, fault identification, troubleshooting of electromechanical equipment through tools are performed according to the fault to restore the equipment to normal.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Specification for the use of electrical tools and instruments; 2. Reading method of the electrical schematic diagram; 3. Troubleshooting method of the fault point; 4. Troubleshooting specification; 5. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	OPERATION AND MAINTENANCE OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	501
TASK TITLE	ON-SITE MANAGEMENT OF ELECTROMECHANICAL EQUIPMENT	**TASK NO.**	5014
PERFORMANCE CRITERIA	The person performing this task must be able to conduct on-site management of electromechanical equipment according to the on-site management standard (6S) of the workshop.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Signboard; 2. Handcart; 3. Broom; 4. Mop; 5. Cleaning cloth; 6. Storage box; 7. Wastebin; 8. Magnetic cleaning vehicle of iron filings; 9. Shelf; 10. Tool cabinet.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety; 2. Select appropriate tools and equipment; 3. Know well management standards of field equipment; 4. Check the placement and operation of the equipment; 5. Check tool categories and storage specification; 6. Check the storage conditions and specifications of raw materials and parts; 7. Detect the circuit for safety hazards; 8. Check the data and operational logs of each equipment; 9. Check work safety signs and safety accesses; 10. Rectify and clean up the equipment and site.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Know well management standards of field equipment; 1.2 Check the placement and operation of the equipment; 1.3 Check the placement of tools, raw materials and products; 1.4 Detect the circuit for safety hazards; 1.5 Check equipment data and work safety signs; 1.6 Rectify and clean up equipment and the production site. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of 6S site management; 2.2 Equipment placement and operation specifications;

	2.3 Tool layout specification; 2.4 Regulations on work safety. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 6S management standard; 3.2 Specifications for safe and civilized production. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Standardized management of electromechanical equipment is performed in accordance with the 6S management standard to ensure the work safety.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Requirements of civilized on-site production; 2. Safety operation and labour protection; 3. Usage of tools; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	INSTALLATION OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	MECHANICAL ASSEMBLY OF EQUIPMENT ACCORDING TO DRAWINGS	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must carry out mechanical assembly of equipment in accordance with technical requirements and drawings.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Jaw tools, such as needle-nose pliers, flat-nosed pliers, tweezers, etc.; 2. Shearing tools, such as diagonal pliers, scissors, etc.; 3. Fastening tools, such as screwdrivers, wrenches, etc.; 4. Welding tools, such as electric soldering iron, welding flux, etc.; 5. Measuring tools, such as steel ruler, level gauge, angle meter, dial indicator, etc.; 6. Fixtures, such as screw fixture, lever fixture, pneumatic fixture, hydraulic fixture, etc.; 7. Personal protective equipment, such as work clothes, safety helmets, gloves, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools and equipment; 2. Observe the preventive measures for health and safety; 3. Reading of mechanical part drawings and assembly drawings; 4. Develop assembly process specifications; 5. Mount mechanical parts; 6. Mount mechanical components; 7. Adjust and correct the equipment according to installation requirements; 8. Check the mechanical structure of the equipment; 9. Clean the tools, equipment and workplaces; 10. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable installation tools; 1.2 Read part drawings and assembly drawings; 1.3 Develop assembly process specifications; 1.4 Assemble the mechanical structure; 1.5 Adjust and correct mechanical components. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of using clamping tools; 2.2 General mechanical technical assembly specifications and principle; 2.3 Assembly process specification. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Reading of part drawings and assembly drawings for mechanical assembly; 3.2 Usage and measurement of tools and measuring tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The mechanical assembly of equipment is performed in accordance with technical requirements and drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Measurements and procedures for maintenance operations; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	INSTALLATION OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	LAYOUT AND INSTALLATION OF Electrical CircuitS	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to carry out electrical circuit layout, installation and wiring in accordance with technical requirements and electrical installation drawings.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Space ranging equipment, including measuring tapes and level gauges; 2. Full set of electrical toolbox, including multimeters, diagonal pliers, needle-nose pliers, plum pliers, various hand pliers, wrenches and electric soldering irons, wire strippers, etc.; 3. Commonly-used low-voltage apparatus, including contactors, thermal relays, fusible cutouts, circuit breakers, master electrical appliances, leakage protectors, etc.; 4. Personal protective equipment, such as work clothes, insulant shoes, safety helmets, gloves, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive regulations for health and safety; 2. Choose suitable electrical tools and equipment; 3. Read the electrical element layout, electrical installation wiring diagram and electrical schematic diagram; 4. Identify and select low-voltage apparatus; 5. Conduct the solid installation of electrical components; 6. Assemble power circuits, main circuits and auxiliary circuits; 7. Check whether the circuit function meets the requirements; 8. Clean the tools, equipment and workplaces; 9. Safely arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose electrical tools and equipment; 1.2 Identify and select low-voltage apparatus; 1.3 Install electrical components according to the electrical element layout; 1.4 Conduct wiring according to the electrical schematic diagram; 1.5 Settle circuits and feed the conductor into the wiring duct; 1.6 Check for faults. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of drawing the electrical schematic diagram; 2.2 Layout principle of electrical components; 2.3 Installation of the installation and wiring of electrical appliances; 2.4 Working principle of low-voltage apparatus;

	2.5 Working principle of AC/DC motors and transformers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical safety; 3.2 Structural principle of low-voltage apparatus. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The electrical circuit layout, installation and wiring are performed in accordance with technical requirements and electrical installation drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	INSTALLATION OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION OF HYDRAULIC PRESSURE CONTROL CIRCUIT	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to install hydraulic and pneumatic circuits in accordance with technical requirements and the manufacturer's installation manual.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Mobile filter trolley; 2. Hose press; 3. Pipe bender; 4. Cleaning machine; 5. Pressure gauges; 6. Power sources; 7. Air compressor; 8. Full set of mechanical assembly tools; 9. Personal protective equipment, such as work clothes, safety helmets and gloves.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety; 2. Select appropriate tools and equipment; 3. Read the layout diagram of components and the installation and connection diagram of control circuit; 4. Identify hydraulic (pneumatic) components, pipelines, pipe joints, etc.; 5. Choose commonly-used mechanical assembly tools; 6. Assemble the hydraulic (pneumatic) system circuit, including component installation, installation of pipelines and joints, pipeline fixing; 7. Test the tightness of the circuit; 8. Check whether the circuit is functioning properly; 9. Clean the tools, equipment and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Make an inventory of components, equipment and tools; 1.2 Identify hard pipes, hoses and pipe joints; 1.3 Install components according to the component layout of control circuits; 1.4 Install the pipeline according to the installation connection diagram of control circuits; 1.5 Fix pipe clamps and pipelines; 1.6 Check for faults. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Sealing principle of hydraulic/pneumatic control circuits; 2.2 Working principle of hydraulic/pneumatic control circuits;

workplaces; 10. Safely arrange and store the tools and equipment.	2.3 Installation steps and principles of hydraulic/pneumatic control circuits. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operational theory of the hydraulic(pneumatic) control; 3.2 Specification for the use of commonly-used tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Hydraulic/pneumatic circuits are installed in accordance with technical requirements and the manufacturer's installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	INSTALLATION OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	502
TASK TITLE	INSTALLATION SITE MANAGEMENT AND TECHNICAL DISCLOSURE	**TASK NO.**	5024
PERFORMANCE CRITERIA	The person performing this task must be able to perform installation site management and technical disclosure in accordance with technical requirements and the manufacturer's installation manual.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Space measuring tools, including measuring tapes, carpenter's squares, level gauges, angle meters, steel rulers, etc.; 2. Optical measuring instruments, such as distance measuring instrument, total stations, theodolites, etc.; 3. Acoustic measuring instruments, such as ultrasonic thickness gauges, ultrasonic wave velocimeters, etc.; 4. Thermometer used to measure the temperature of environment or equipment; 5. Interphone; 6. Computer; 7. Safety protection equipment, such as safety helmets, safety shoes, gloves, safety ropes, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Read the drawings, technical documents and relevant specification standards of the construction site; 2. Interpret design requirements and technical documents, clarify tasks and requirements, and stress safety precautions and quality requirements; 3. Organize on-site personnel and arrange tasks; 4. Coordinate all parties to solve technical problems on site; 5. Check the safety measures on site; 6. Check the quality and progress of construction projects; 7. Identify and solve problems without delay to ensure safety and quality; 8. Prepare and file disclosure	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read the implementation requirements; 1.2 Follow the safe construction process; 1.3 Adopt emergency measures. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Safety principle of personnel and equipment; 2.2 Principle of standardized construction; 2.3 Site management principle; 2.4 Principle of timely filing. **3.0 Theories** The person performing this task must be able to explain the following:

documents.	3.1 Overall planning and detailed requirements of a construction planning scheme; 3.2 Method of on-site quality control; 3.3 Channels and ways of on-site coordination and communication; 3.4 Standards for site cleaning and rectification; 3.5 Safety measures and contingency plans; 3.6 Contents and Specifications of disclosure. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Quality control skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Hydraulic and pneumatic control circuits are installed in accordance with the manufacturer's specifications and technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Waste disposal methods; 5. Awareness of quality control.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	INSPECTION AND DEBUGGING OF MECHANICAL STRUCTURE	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and debug the mechanical structure in accordance with technical requirements and the equipment manufacturer's installation and debugging manual.		
RANGE STATEMENT	The task can be performed in offices under the supervision of a Senior Technician or a Mechanical Engineer. The tools and equipment to be used include: 1. Dimensional measuring toolbox, including vernier caliper, outside micrometer, flat ruler, square ruler, plug gauge, thread gauge, feeler gauge, gauge block, and lever dial indicator; 2. Routine toolbox, including flat-mouth pliers, needle-nose pliers, copper rods, assorted files, oilstone, several inner hexagon wrenches, several screwdrivers, monkey wrench and sandpaper; 3. Level gauge; 4. Sine bar; 5. Personal protective equipment, such as gloves and goggles.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety; 2. Select appropriate tools and equipment; 3. Reading of mechanical part drawings and assembly drawings; 4. Check mechanical components for installation integrity; 5. Check the accuracy of the installation and coordination of parts; 6. Test the fastness and tightness of mechanical components; 7. Test the flexibility of transmission components; 8. Test the operation of mechanical parts; 9. Adjust the mechanism and strengthen lubrication; 10. Clean the tools, equipment and workplaces;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select appropriate tools and equipment; 1.2 Reading of mechanical part drawings and assembly drawings; 1.3 Check mechanical components for installation integrity; 1.4 Check the installation accuracy and tightness; 1.5 Test the flexibility of mechanical transmission components; 1.6 Test the operation of mechanical parts; 1.7 Adjust installation and lubricate the equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of mechanical equipment assembly; 2.2 Principle of mechanical equipment transmission; 2.3 Specification for measurement of mechanical accuracy;

11. Safely arrange and store the tools and equipment.	2.4 Specification for testing mechanical structures. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Functions of mechanical structure parts; 3.2 Disassembly and installation of mechanical parts; 3.3 Method of accuracy measurement and installation and debugging of mechanical fitting parts; 3.4 Maintenance of mechanical equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The mechanical structure conformity inspection and testing are performed in accordance with technical requirements and the equipment manufacturer's installation and debugging manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of debugging tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety procedures; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	DEBUGGING OF ELECTRICAL CONTROL CIRCUITS	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to debug the electrical control circuit in accordance with technical requirements and manufacturer's specifications.		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Electrical toolboxes; 2. Screwdriver, crimpling plier, wire stripper, wiring terminal, trigger line and other basic tools; 3. Conductor; 4. Tachometer; 5. Electricity test pencil; 6. Wiring terminal; 7. Personal protective equipment, such as gloves and goggles.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for healthy and safe use of electricity; 2. Select appropriate electrical tools and instruments; 3. Read the electrical schematic diagram and electrical installation specification; 4. Check the fastness of main circuits and control circuits to eliminate virtual connection, short connection and missing connection; 5. Check the wiring of components to eliminate wrong and missing connection; 6. Test the functions of main circuits and control circuits; 7. Test the functions of auxiliary circuit and lighting circuits; 8. Clean the tools, equipment and workplaces; 9. Arrange and store the tools and equipment;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select appropriate electrical tools and instruments; 1.2 Check the circuit wiring of the main circuits and control circuits to eliminate virtual connection and missing connection without delay; 1.3 Check the wiring of components; 1.4 Test components; 1.5 Test the functions of main circuits and control circuits; 1.6 Test the function of power circuits and auxiliary circuits. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of electrical control; 2.2 Principles of electrical circuit installation specification; 2.3 Principle of component test specification; 2.4 Principle of circuit test specification.

10. Observe the preventive measures for health and safety during working.	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 Installation method of electrical circuits; 3.2 Inspection method of electrical circuits; 3.3 Test method of electrical circuits. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The electrical control circuits of the equipment are debugged in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of debugging tools; 2. Safety operation of measuring instruments; 3. Standardized operation of operating tools; 4. Safe electricity operation; 5. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	DEBUGGING OF HYDRAULIC AND PNEUMATIC CIRCUITS	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to debug the hydraulic pressure circuits in accordance with technical requirements and manufacturer's specifications		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: 1. Pressure gauge toolbox, electro-hydraulic top pulling multi-purpose machine; 2. Basic hydraulic tools such as hydraulic puller, hydraulic wrench, hydraulic flange separator and hydraulic bolt stretcher; 3. Sensors such as pressure sensor and temperature sensor. 4. Installation tools such as screwdriver and wiring terminal; 5. Tachometer; 6. Personal protective equipment, such as gloves and goggles.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety; 2. Select appropriate tools and equipment; 3. Read the schematic diagram of hydraulic (pneumatic) transmission; 4. Check if the connection of the liquid (gas) pressure circuit is correct; 5. Detect the pressure of the liquid (gas) pressure source; 6. Turn on the pressure control switch; 7. Test the function of the liquid (gas) pressure circuit; 8. Test the pressure of the liquid (gas) pressure component; 9. Test the operating conditions of the executing component; 10. Clean the tools, equipment and workplaces; 11. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read the schematic diagram of liquid (gas) pressure; 1.2 Check if the connection of the liquid (gas) pressure circuit is correct; 1.3 Test the pressure of the liquid (gas) pressure source; 1.4 Test the function of the liquid (gas) pressure circuit; 1.5 Test the operating conditions of the executing component. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Hydraulic (pneumatic) transmission principle; 2.2 Installation specifications for liquid (gas) circuits; 2.3 Liquid (gas) circuit testing procedures. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Types and functions of liquid (gas) pressure; 3.2 Methods of pressure debugging; 3.3 Methods for testing liquid (gas) circuits; 3.4 Methods for debugging the speed of hydraulic (pneumatic) executing components. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The liquid (gas) pressure circuit of the equipment is debugged in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of debugging tools; 2. Safety operation of measuring instruments; 3. Standardized operation of operating tools; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	DEBUGGING OF KEY COMPONENTS	**TASK NO.**	5034
PERFORMANCE CRITERIA	The person performing this task must be able to complete the debugging of key components in accordance with technical requirements and manufacturer's equipment instructions		
RANGE STATEMENT	The task can be performed in the workshop or the production site under the supervision of mechanical engineers or electrical engineers. The tools and equipment to be used include: 1. Meter, oscilloscope, signal generator, DC voltage-stabilized power, and other devices; 2. Complete set of electrical tools and measuring tools; 3. Slotted screwdriver, cross screwdriver, other types of screwdrivers, wrench, and other tools; 4. Electric soldering iron, welding wire, flux, etc; 5. Measuring tools; 6. Personal protective equipment, such as gloves and goggles.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety; 2. Select appropriate electrical tools and equipment; 3. Read electrical schematic diagrams and key component (such as sensor) wiring diagrams; 4. Detect whether the wiring of key components (such as sensor) is correct; 5. Test the functionality of each component; 6. Adjust and optimize the parameters of key components (such as sensor) to the working range; 7. Clean the tools, equipment and workplaces; 8. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select appropriate electrical tools and equipment; 1.2 Read electrical schematic diagrams and key component wiring diagrams; 1.3 Check whether the wiring of key components is correct; 1.4 Test the functions of components; 1.5 Adjust and optimize the parameters of key components (such as sensor) to the reasonable range; **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Working principles of key components such as sensor; 2.2 Test specifications for key components. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The type and functional principle of the sensor;

	3.2 Methods for debugging the sensor. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The debugging of key components in electromechanical equipment such as sensor and relay is completed in accordance with technical requirements and manufacturer's manuals.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of debugging tools; 2. Safety operation of measuring instruments; 3. Safety operation of operating tools; 4. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	CORRECTION AND OPTIMIZATION OF CONTROL PROGRAMS	**TASK NO.**	5035
PERFORMANCE CRITERIA	The person performing this task must be able to correct and optimize control programs in accordance with technical requirements and electromechanical equipment control requirements.		
RANGE STATEMENT	The task can be performed on in the electromechanical equipment workshop under the supervision of senior technicians or electrical engineers. The tools and equipment to be used include: 1. Multimeter; 2. Complete set of electrical tools; 3. Assembly tools; 4. Computer; 5. PLC; 6. PLC programming software; 7. Conductor.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Comply with equipment safety operation procedures when performing tasks; 2. Select appropriate tools and equipment; 3. Find out the reason why the equipment's program function cannot be implemented; 4. Optimize the equipment's control programs; 5. Download the program to the controller; 6. Test the optimized control program; 7. Operate the equipment; 8. Clean the tools, equipment and workplaces; 9. Arrange and store the tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify the range of faults in the control program of electromechanical equipment; 1.2 Optimize the equipment's control programs; 1.3 Download the optimized programs; 1.4 Test the optimized programs. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 PLC programming principle; 2.2 Program optimization specifications; 2.3 Program debugging steps. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 How to use programming software; 3.2 Instructions for PLC programming; 3.3 Program optimization methods; 3.4 Program debugging methods.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Troubleshooting skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The control programs are optimized in accordance with technical requirements and the on-site situation of electromechanical equipment.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of debugging tools; 2. Safety operation of measuring instruments; 3. Safety operation of operating tools; 4. Maintenance operation processes and procedures; 5. Waste disposal methods.

OCCUPATION	MECHATRONICS TECHNICIAN	**OCCUPATION CODE**	500
DUTY TITLE	DEBUGGING OF ELECTROMECHANICAL EQUIPMENT	**DUTY NO.**	503
TASK TITLE	ELECTROMECHANICAL EQUIPMENT DEBUGGING	**TASK NO.**	5036
PERFORMANCE CRITERIA	The person performing this task must be able to complete electromechanical equipment debugging in accordance with technical requirements and manufacturer's equipment manuals		
RANGE STATEMENT	The task can be performed in workshops or production sites under the supervision of senior technicians or mechatronics engineers. The tools and equipment to be used include: The tools and equipment to be used include: 1. Multimeter; 2. Complete set of electrical tools; 3. Assembly tools; 4. Computer; 5. PLC; 6. PLC programming software; 7. Conductor; 8. Personal protective equipment, such as gloves and goggles.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Select appropriate tools and equipment; 3. Inspect and adjust the mechanical components; 4. Check the circuit connections and electrical elements; 5. Check the gas circuits and hydraulic circuits; 6. Check the control programs; 7. Check the power supply; 8. Power on the idle test run; 9. Run under load; 11. Disconnect the power supply and stop running; 12. Clean the tools, equipment and workplaces; 13. Arrange and store the tools and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Inspect and adjust the mechanical components; 1.2 Check the electrical circuits and hydraulic pressure circuits; 1.3 Check the control programs; 1.4 Power on the idle test run; 1.5 Run under load. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of mechanical transmission; 2.2 Electrical control principle; 2.3 Complete equipment debugging. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Mechanical assembly methods;

equipment in a standardized way.	3.2 Electrical assembly methods; 3.3 Program optimization methods; 3.4 Complete equipment adjustment methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The complete electromechanical equipment debugging is done in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating tools; 2. Safe power-on operations; 3. Programming specifications; 4. Equipment debugging procedures; 5. Waste disposal methods.

TABLE 1: DACUM TABLE FOR MECHATRONICS TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Operation and maintenance of electromechanical equipment	1.1 Operation of electromechanical equipment. 1.2 Regular maintenance of electromechanical equipment. 1.3 Simple troubleshooting of typical electromechanical equipment. 1.4 On-site equipment management.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Reading of technical drawings **Tools and equipment** · Personal protective equipment such as safety shoes, goggles and safety helmets · Complete set of processing tools · Complete set of measuring tools · General lathe · Electrical tools **Materials** · Conductors, number tubes, gas lines, etc · Machinery lubricating oil · Soldering tin **Requirements for employees** · Teamwork spirit · Time consciousness · Quality consciousness
2.0 Installation of electromechanical equipment	2.1 Mechanical assembly of equipment according to drawings. 2.2 Overall layout and installation of electrical circuits. 2.3 Installation of hydraulic and pneumatic control circuits. 2.4 Installation site management and technical disclosure.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Mechanical assembly knowledge and skills · Electrical installation knowledge and skills · Hydraulic and pneumatic installation knowledge and skills · Reading and drawing of technical drawings · Knowledge of work safety and emergency response

DUTIES	TASKS	ENABLERS
		Tools and equipment · Space ranging equipment, including measuring tapes and level gauges; · Complete fitter's toolbox · Acoustic measuring instrument · Complete electrical toolbox · Commonly-used low-voltage apparatus · Optical measuring instrument · Acoustic measuring instrument · Air compressor, pipe press, etc. · Personal protective equipment, such as work clothes, insulant shoes, safety helmets, gloves, etc. **Materials** · Conductors, number tubes, gas lines, etc · Machinery lubricating oil · Soldering tin **Requirements for employees** · Teamwork spirit · Time consciousness · Quality consciousness
3.0 Debugging of electromechanical equipment	3.1 Inspection and debugging of mechanical structure. 3.2 Debugging of electrical control circuits and hydraulic and pneumatic circuits. 3.3 Debugging of key components. 3.4 Correction and optimization of control programs. 3.5 Complete electromechanical equipment debugging.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Reading of technical drawings and materials · Making of mechanical drawings · Use of assembly tools and electrical tools · Detection of assembly accuracy of functional components · Reading of electrical schematic diagrams · Test of electrical circuits · PLC programming principle · Equipment debugging methods

DUTIES	TASKS	ENABLERS
		Tools and equipment · Personal protective equipment such as safety shoes, gloves and safety helmets · Complete fitter's toolbox · Complete electrical toolbox **Materials** · Conductors, number tubes, gas lines, etc · Machinery lubricating oil · Soldering tin **Requirements for employees** · Teamwork spirit · Efficiency consciousness · Quality consciousness