NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

CBET	Competency Based Education and Training
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Point
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
OSHA	Occupational Safety and Health Administration
SOPS	Standard Operating Procedures
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

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 Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tool of assessment of the prescribed outcomes.
Performance Criteria:	Indicate the expected end results or outcome in 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:	It is a set of statement, 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, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.
Underpinning Knowledge:	This is 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.
Occupational Competence:	The application of knowledge and skills to perform consistently to the standards required in the work context.

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 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 Mechanical Equipment Maintenance 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 Mechanical Equipment Maintenance 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 survey 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 MECHANICAL EQUIPMENT MAINTENANCE TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by an Mechanical Equipment Maintenance 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 Mechanical Equipment Maintenance Technician 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.

Scope of occupational standards for Mechanical Equipment Maintenance Technician: Personnel engaged in installation, debugging, maintenance and repair of mechanical part and playing an important role in the fields such as mechanical product collection, transportation, storage and processing. Mechanical equipment maintenance technicians assemble and debug the mechanical parts, components or product assembly with fitter's tool, drilling machine, tooling or other tools. Staff in this post shall strictly abide by internal agreement, standard operation procedures (SOP) and current good manufacturing practice (cGMP). Generally, the Mechanical Equipment Maintenance Technician performs the following responsibilities:

a) Open-box inspection of mechanical equipment;

b) Reading of installation drawings of mechanical equipment;

c) Selection of installation and maintenance tools;

d) Safety protection for mechanical equipment installation;

e) Powering on/off and simple maintenance of the mechanical equipment

f) Cleaning of the internal and external equipment parts

g) Selection of suitable lubricant for equipment lubrication

h) Filling in the maintenance record

i) Reading of the mechanical equipment drawings

j) Identification of the common mechanical faults

k) Implementation of the safety measures for workplace

l) Preparation before mechanical equipment installation

m) Installation of the ordinary cutting equipment

n) Debugging of the ordinary cutting equipment

o) Basic operation for benching of mechanical components

p) Hole and thread machining of mechanical components

q) Diagnosis of the faults of ordinary cutting equipment

r) Repairing of the transmission mechanism of mechanical equipment

s) Repairing of the hydraulic/pneumatic system of mechanical equipment

t) Standard operation and maintenance of mechanical 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 MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN – NTA 5

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION OF THE MECHANICAL EQUIPMENT	**DUTY NO.**	501
TASK TITLE	INSTALLATION AND POSITIONING OF THE LATHE	**TASK NO.**	5011
PERFORMANCE CRITERIA	The person performing this task must be able to position correctly before installing grinding, boring and plano milling machine according specified standards, procedures as well as mastered knowledge and skills.		
RANGE STATEMENT	The task can be performed in the factory under the supervision of mechanical engineers. The equipment and tools to be used include: 1. Supporting tool; 2. Installation tool; 3. Measuring tool; 4. Positioning tool; 5. Removal tool; 6. Cleaning tool; 7. Clamps; 8. Lifting equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare necessary equipment and instruments for mechanical equipment installation; 2. Use the tools, clamps, measuring and auxiliary tools; 3. Position the mechanical equipment; 4. Set up the underboarding; 5. Equipment in place; 6. Alignment and leveling; 7. Secondary grouting; 8. Operate the mechanical equipment in the trial.	**Detailed knowledge about:**

	1.0 Methods The person performing this task must be able to explain how to: 1.1 Fix the lathe; 1.2 Use the Operation Manual; 1.3 Fix the mechanical equipment. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Equipment installation principle; 2.2 Positioning installation principle. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Mechanical drafting and reading; 3.2 Tolerance Fit and Technical Measurement; 3.3 Basic design calculation; 3.4 Selection of common materials and metal thermal treatment; 3.5 Machining process and method; 3.6 Fitter's skills; 3.7 Electrical knowledge; 3.8 Hydraulic (pneumatic) knowledge; 3.9 Safety and civilized construction and environmental protection; 3.10 Quality management. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Honest and trustworthy; 4.3 Safe operation; 4.4 Time management.
DESCRIPTION OF THE END PRODUCT / SERVICE	The ordinary lathe is positioned correctly according to technical requirements and installation process specification.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools;

	2. Occupational safety and health; 3. ISO standards.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	COMMISSIONING OF MACHINERY AND EQUIPMENT	**DUTY NO.**	501
TASK TITLE	INSTALLATION AND FIXING OF THE LATHE	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to install and fix the lathe correctly with knowledge and skills according to the specified standards and procedures.		
RANGE STATEMENT	The task can be performed in the factory under the supervision of mechanical engineers. The equipment and tools to be used include: 1. Supporting tool; 2. Installation tool; 3. Measuring tool; 4. Positioning tool; 5. Removal tool; 6. Cleaning tool; 7. Clamps; 8. Lifting equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Fix machinery and equipment fundamentally; 2. Match the outline dimension of electromechanical equipment; 3. Confirm the foundational strength and rigidity of electromechanical equipment; 4. Confirm the foundational stability and durability of electromechanical equipment; 5. Align the foundational centroid and gravity center of electromechanical/mechanical equipment; 6. Elevate machinery and equipment fundamentally; 7. Prepress machinery and equipment fundamentally;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare the technical data; 1.2 Confirm the mechanical equipment structure; 1.3 Prepare the tools and materials; 1.4 Confirm the installation steps and operation; 1.5 Confirm the fixing forms and methods of machinery. **2.0 Principle** The person performing this task must be able to explain the following principles:

8. Accomplish machinery and equipment vibration isolation fundamentally; 9. Lift the hoisting equipment; 10. Confirm the foundation bolts; 11. Fix the foundation bolts; 12. Pour the epoxy mortar.	2.1 Positioning installation principle; 2.2 Equipment fixing principle. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Reading of equipment installation and civil engineering drawings; 3.2 Reading of part and assembly drawings; 3.3 AC/DC circuit wiring; 3.4 Knowledge of hoisting lifting machinery; 3.5 Fixing machine technique; 3.6 Knowledge of engineering materials science; 3.7 Pouring technology. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Honest and trustworthy; 4.3 Safe operation; 4.4 Time management.
DESCRIPTION OF THE END PRODUCT	The ordinary lathe is fixed correctly according to technical requirements and installation process specification.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Safety operation equipment and tools; 3. Scope of duties.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ORDINARY CUTTING EQUIPMENT DEBUGGING	**DUTY NO.**	502
TASK TITLE	ADJUSTMENT OF THE ACCURACY OF MEDIUM-SIZED GENERAL-PURPOSE EQUIPMENT INSTALLATIONS	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to adjust the accuracy of medium-sized general-purpose equipment installations with knowledge and skills according to specified standards and procedures.		
RANGE STATEMENT	The task can be performed in the factory under the supervision of mechanical engineers. The equipment and tools to be used include: 1. Supporting tool; 2. Installation tool; 3. Measuring tool; 4. Positioning tool; 5. Removal tool; 6. Cleaning tool; 7. Clamps; 8. Lifting equipment.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment; 2. Align and level the equipment; 3. Level the guide rail; 4. Adjust and fix the junction surface; 5. Adjust the sliding/movable guide rails; 6. Adjust the rotating direction of motor; 7. Adjust the radial run-out and axial displacement of spindle;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Operate medium-sized general-purpose equipment; 1.2 Use operating manual; 1.3 Use medium-sized general-purpose equipment. **2.0 Principle** The person performing this task must be able to explain the following principles:

8. Adjust the parallelism of lathe saddle movement to the spindle axis; 9. Adjust the axial displacement of lead screw; 10. Adjust the height of the spindle and the two tops of the tailstock; 11. Adjust the perpendicularity between blade carrier and spindle; 12. Check and install the guide rail; 13. Record the forms and other documents; 14. Clean the working tools and equipment; 15. Store the tools, equipment and safety device; 16. Observe the preventive measures for health and safety during working.	2.1 Leveling and alignment principle; 2.2 Equipment installation principle. **3.0 Theories** The personnel shall be able to explain the following contents: 3.1 Knowledge of mechanical drafting and reading; 3.2 Tolerance fit and technical measurement; 3.3 Basic design calculation; 3.4 Selection of common materials and metal thermal treatment; 3.5 Machining process and method; 3.6 Fitter's skills; 3.7 Electrical knowledge; 3.8 Hydraulic (pneumatic) knowledge; 3.9 Safety civilized construction and environmental protection; 3.10 Quality management. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Honest and trustworthy; 4.3 Safe operation; 4.4 Time management.
DESCRIPTION OF THE END PRODUCT / SERVICE	The installation precision of medium-sized general-purpose equipment is adjusted according to relevant standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Occupational safety and health; 3. ISO standards.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ORDINARY CUTTING EQUIPMENT DEBUGGING	**DUTY NO.**	502
TASK TITLE	COMMISSIONING OF THE MEDIUM-SIZED GENERAL-PURPOSE EQUIPMENT	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to commission and maintain of medium-sized general-purpose equipment installations with knowledge and skills according to specified standards and procedures.		
RANGE STATEMENT	The task can be performed in the factory under the supervision of mechanical engineers.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Observe the standard operation procedures (SOP); 3. Observe the operation manual of the equipment; 4. Identify the motion diagram of mechanical drive; 5. Understand the electrical diagram; 6. Know the functions of control lever and buttons and be capable of operation; 7. Be familiar with the equipment structure and performance and prevent overload operation; 8. Inspect the power supply; 9. Ensure each fastener is without loosening; 10. Check whether the motor operates normally; 11. Install the tool; 12. Control the cooling pump; 13. Conduct hydraulic operation and lubricating;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Calculate the overall efficiency of equipment; 1.2 Calculate the efficiency of equipment; 1.3 Conduct the lathe operation; 1.4 Confirm the productivity index of lathe. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Integration of overall efficiency of equipment (OEE) and reliability; 2.2 Principle of good manufacturing practice (GMP); 2.3 Hazard Analysis and Critical Control Point (HACCP). **3.0 Theories** The person performing this task must be able to explain the following:

14. Detect the guide rail; 15. Check the appearance quality; 16. Check the radial and end run-out of spindles; 17. Conduct the dry run and load test of the main motion and feed motion; 18. Submit the performance report; 19. Fill in whole forms, records and other documents; 20. Clean the working tools and equipment; 21. Store the tools, equipment and safety device properly; 22. Pay attention to the health and safety when performing tasks.	3.1 Manual and automatic operation of lathe; 3.2 Classification of production system; 3.3 Efficiency of operation machine; 3.4 Basic electrical control; 3.5 Hydraulic Transmission. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Communication skills; 4.3 Honesty and integrity; 4.4 Computer skills; 4.5 Good data acquisition skills; 4.6 Time management skills; 4.7 Keeping promises.
DESCRIPTION OF THE END PRODUCT	The lathe is debugged according to specified standard and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. Safety operation equipment and tools; 3. Scope of duties.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MACHINE MECHANICAL EQUIPMENT COMPONENTS	**DUTY NO.**	503
TASK TITLE	STEREO SCRIBING	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to perform the stereo scribing on the mechanical equipment components according to the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Scribing tools (scribing platform, square box, V-shaped block, scribing needle/compass, steel plate ruler, height Vernier caliper and sample punching pin); 2. Measuring tools (steel tape, Vernier caliper, universal bevel protractor and 90° angle ruler); 3. Coating of scribing.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Conduct stereo scribing on boxes; 4. Conduct stereo scribing on lathe beds; 5. Submit the work reports; 6. Submit whole forms, records and other documents; 7. Arrange and clean the tools, equipment and workplace; 8. Store the tools, equipment and safety device properly.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Conduct stereo scribing on boxes; 1.4 Conduct stereo scribing on lathe beds. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Circumstantial knowledge of scribing workpiece in complicated shapes; 3.2 Circumstantial knowledge for selecting scribing reference; 3.3 Circumstantial knowledge of alignment and material borrowing. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Stereo scribing is conducted on large workpiece such as box body and lathe bed as well as workpiece in complicated shape according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MACHINE MECHANICAL EQUIPMENT COMPONENTS	**DUTY NO.**	503
TASK TITLE	SAWING, FILE CUTTING AND CHIPPING	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to saw, file cut and chip the mechanical equipment components according to the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (workbench, bench vice and grinding machine); 2. Fitter's tools (chisel, hammer, saw bow, saw blade and file); 3. Measuring tools (Vernier caliper, knife straight edge, 90° angle ruler and feeler gauge).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Sharpen the oil groove; 4. Chip the oil groove of bearing bush; 5. Conduct sawing till the workpiece meets the machining precision requirement; 6. Conduct file cutting till the workpiece meets the machining precision requirement; 7. Submit the work reports; 8. Whole forms, records and other documents; 9. Clean the tools, equipment and workplace; 10. Store the tools, equipment and safety device properly.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Sharpen the oil groove; 1.4 Chip the oil groove of bearing bush; 1.5 Conduct sawing; 1.6 Conduct file cutting. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Sharpening and selection of different chisels; 3.2 Chipping; 3.3 Sawing; 3.4 File cutting; 3.5 Geometric tolerance and measurement skills. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The oil groove is chipped according to approved standards and procedures, and cut the oil groove of bearing bush; the 45# steel part is sawed and file cut and the machining precision requirements are met.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational Safety and Health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MACHINE MECHANICAL EQUIPMENT COMPONENTS	**DUTY NO.**	503
TASK TITLE	HOLE FORMING AND THREAD MACHINING	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to perform bore and thread on mechanical equipment components according to the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (work table, bench vice, electric hand drill, bench drilling machine and grinding machine); 2. Fitter's tools (center drill, twist drill, screw tap and tap wrench); 3. Measuring tools (Vernier caliper and 90° angle ruler).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Operate electric hand drills and bench drills; 4. Sharpen the standard twist drills; 5. Conduct drilling till the workpiece meets the machining precision requirement; 6. Conduct thread machining till the workpiece meets the machining precision requirement; 7. Grind the worn tap; 8. Submit the work reports; 9. Submit whole forms, records and other documents; 10. Arrange and clean the tools, equipment and workplace; 11. Store the tools, equipment and safety device properly.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Operate electric hand drills and bench drills; 1.2 Sharpen the standard twist drills; 1.3 Drill holes; 1.4 Conduct thread machining; 1.5 Grind the worn tap. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Cutting characteristic and sharpening of standard twist drill; 3.2 Drilling; 3.3 Tapping thread; 3.4 Tap fracture treatment. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Electric hand drills and bench drills are operated according to approved standards and procedures; the standard twist drills are sharpened and the worn taps are ground; holes in 45# steel part are drilled till them meet the machining precision requirement; and threads are made on 45# steel parts.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FAULT DIAGNOSIS OF ORDINARY CUTTING EQUIPMENT	**DUTY NO.**	504
TASK TITLE	DIAGNOSIS OF THE FAULTS OF THE MEDIUM-SIZED GENERAL-PURPOSE EQUIPMENT	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to conduct visual fault diagnosis on medium-sized general-purpose equipment according to this standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (lathes, milling machines and shaping machines); 2. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 3. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 4. Pliers (wire cutter, needle-nose pliers and circlip pliers); 5. Knocking tools (hammers and copper rods); 6. Electric tools (electric hand drill, angle grinder and straight grinder); 7. Special tools (crow bars and pullers).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Diagnose the common faults of the lathes, milling machines and shaping machines; 4. Submit the work reports; 5. Submit whole forms, records and other documents;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Operate the lathes, milling machines and shaping machines; 1.4 Visually diagnose the common faults of the lathes, milling machines and shaping machines.

6. Arrange and clean the tools, equipment and workplace; 7. Store the tools, equipment and safety device properly.	**2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Structure and working principle of lathes, milling machines and shaping machines; 3.2 Common faults of lathes, milling machines and shaping machines. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The common faults of medium-sized general-purpose equipment are correctly diagnosed, such as lathes, milling machines and shaping machines according to approved standard and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational Safety and Health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FAULT DIAGNOSIS OF ORDINARY CUTTING EQUIPMENT	**DUTY NO.**	504
TASK TITLE	DETECTION OF GEOMETRIC ACCURACY OF MEDIUM-SIZED GENERAL-PURPOSE EQUIPMENT WITH GENERAL MEASURING TOOLS	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to conduct geometric accuracy detection on medium-sized general-purpose equipment with general measuring tools according to this standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (lathes, milling machines and shaping machines); 2. Detection tools (coupled image level, dial gauge, magnetic meter stand, steel ruler and long cylindrical test bar)。		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Detect the geometric accuracy of lathes, milling machines and shaping machines with general measuring tools； 4. Submit the work reports; 5. Submit whole forms, records and other documents; 6. Arrange and clean the tools, equipment and workplace; 7. Store the tools, equipment and safety device properly.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Operate the lathes, milling machines and shaping machines; 1.4 Detect the geometric accuracy of lathes, milling machines and shaping machines with general measuring tools. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Geometric accuracy of lathes, milling machines and shaping machines and its relationship with the machining precision; 3.2 Geometric accuracy detection of lathes, milling machines and shaping machines and use of the relevant instruments; 3.3 Processing of experimental data such as geometric accuracy of lathes, milling machines and shaping machines. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The geometric accuracy of medium-sized general-purpose equipment is detected, such as lathes, milling machines and shaping machines, with general measuring tools according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FAULT DIAGNOSIS OF ORDINARY CUTTING EQUIPMENT	**DUTY NO.**	504
TASK TITLE	DETECTION OF THE WORKING ACCURACY OF MEDIUM-SIZED GENERAL-PURPOSE EQUIPMENT WITH THE TRIAL PROCESSING METHOD	**TASK NO.**	5043
PERFORMANCE CRITERIA	The person performing this task must be able to detect the working accuracy of medium-sized general-purpose equipment with the trial processing method according to this standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (lathes, milling machines and shaping machines); 2. Measuring tools (micrometer, level gauge, gauge block, dial gauge and magnetic meter stand); 3. Detection tools (standard sample, cylinder-shaped testing rod and special precision detection tools).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Detect the working accuracy of lathes, borings, milling machines and shaping machines with the trial processing method; 4. Submit the work reports; 5. Submit whole forms, records and other documents; 6. Arrange and clean the tools, equipment and workplace; 7. Store the tools, equipment and safety device properly.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Operate the lathes, milling machines and shaping machines; 1.4 Detect the working accuracy of lathes, milling machines and shaping machines with the trial processing method. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Working accuracy of lathes, milling machines and shaping machines; 3.2 Working accuracy detection of lathes, milling machines and shaping machines and use of relevant instruments; 3.3 Data processing of experiments measured on the working accuracy of lathes, milling machines and shaping machines. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The working accuracy of medium-sized general-purpose equipment is detected, such as lathes, milling machines and shaping machines, with the trial processing method according to approved standard and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE OF DRIVE MECHANISM	**DUTY NO.**	505
TASK TITLE	MAINTENANCE OF THE BELT AND WHEEL DRIVE MECHANISM	**TASK NO.**	5051
PERFORMANCE CRITERIA	The person performing this task must be able to repair the belt and wheel drive mechanism of lathe according the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (CA6140 lathe and four B2134 new V-shaped belts); 2. Detection tools (dial gauges and magnetic meter stands); 3. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 4. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 5. Knocking tools (hammers and copper rods); 6. Special tools (crow bars and pullers); 7. Auxiliary tools (files, oil pans, abrasive papers, clean cotton yarns and kerosene).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Install and adjust the V-shaped belt and belt wheel of lathe; 4. Repair the drive mechanism of lathe belts; 5. Submit the work reports; 6. Whole forms, records and other documents; 7. Clean the tools, equipment and workplace;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Operate the lathes; 1.4 Install and adjust the V-shaped belt and belt wheel; 1.5 Repair the drive mechanism of belts. **2.0 Principle** The person performing this task must be able to explain the following principles:

8. Store the tools, equipment and safety device properly;	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Variety of belt drive mechanism and fixing mode between belt wheel and shaft; 3.2 Installation of belt drive mechanism and belt wheels; 3.3 V-shaped belt wear and correction. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Repair the belt and wheel drive mechanism according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE OF DRIVE MECHANISM	**DUTY NO.**	505
TASK TITLE	MAINTENANCE OF THE WHEEL DRIVE MECHANISM	**TASK NO.**	5052
PERFORMANCE CRITERIA	The person performing this task must be able to repair the gear drive mechanisms of lathe according the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (CA6140 lathes with the change gear of Z1=64, Z2=100 and Z3=97); 2. Detection tools (dial gauges and magnetic meter stands); 3. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 4. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 5. Knocking tools (hammers and copper rods); 6. Special tools (crow bars and pullers); 7. Auxiliary tools (files, oil pans, abrasive papers, clean cotton yarns and kerosene).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Assemble the gear and shaft of lathes; 4. Assemble the gear shaft assembly and box body of lathes; 5. Assemble and adjust the gear drive mechanism of lathes; 6. Repair the gear of lathes; 7. Submit the work reports; 8. Submit whole forms, records and other documents;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

9. Arrange and clean the tools, equipment and workplace; 10. Store the tools, equipment and safety device properly.	1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Operate the lathes; 1.4 Assemble the gear and shaft of lathes; 1.5 Assemble the gear shaft assembly and box body of lathes; 1.6 Assemble and adjust the gear drive mechanism of lathes; 1.7 Repair the gear of lathes. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Characteristics and assembly technology of gear drive mechanism; 3.2 Assembly between gears and shafts as well as gear shaft assembly and box body; 3.3 Gear repair. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The gear drive mechanism is repaired according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO);

	3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTENANCE OF DRIVE MECHANISM	**DUTY NO.**	505
TASK TITLE	REPAIRING OF SCREW DRIVE MECHANISM	**TASK NO.**	5053
PERFORMANCE CRITERIA	The person performing this task must be able to repair the screw drive mechanism of lathe according the standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (flat nose pliers); 2. Detection tools (dial gauges, magnetic meter stands and micrometers); 3. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 4. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 5. Knocking tools (hammers and copper rods); 6. Fitter's tools (files, electric hand drills, drill bits and reamers); 7. Auxiliary tools (oil pans, abrasive papers, clean cotton yarns and kerosene).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Assemble and adjust the screw drive mechanism of flat nose pliers; 4. Overhaul and change the lead screw and shaft sleeve of flat nose pliers; 5. Submit the work reports; 6. Submit whole forms, records and other documents; 7. Arrange and clean the tools, equipment and workplace;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Assemble and adjust the screw drive mechanism of flat nose pliers; 1.4 Overhaul and change the lead screw and shaft sleeve of flat nose pliers. **2.0 Principle** The person performing this task must be able to explain the following principles:

8. Store the tools, equipment and safety device properly.	2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP); 2.4 Principle of repairing screw drive mechanism. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Characteristics and assembly technology of screw drive mechanism; 3.2 Assembly and adjustment of screw drive mechanism; 3.3 Repairing of the screw drive mechanism. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The screw drive mechanism is repaired according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	REPAIRING OF HYDRAULIC/PNEUMATIC ELEMENTS	**DUTY NO.**	506
TASK TITLE	REPLACEMENT OF HYDRAULIC/PNEUMATIC SYSTEM ELEMENTS	**TASK NO.**	5061
PERFORMANCE CRITERIA	The person performing this task must be able to replace the components of hydraulic/pneumatic system according to this standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (work tables and bench vices); 2. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 3. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 4. Pliers (wire cutter, needle-nose pliers and circlip pliers); 5. Measuring tools (vernier calipers and steel rulers); 6. Auxiliary tools (lubricating oil, chemical fiber fabrics, cooling pumps, oil filters, strainers, cutting fluid pools and cutting fluid).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Clean and change the cooling pump of the lathe cooling system; 4. Clean and change the oil filter of the lathe cooling system (strainer); 5. Clean the cutting fluid pool of the lathe cooling system; 6. Change the cutting fluid pool of the lathe cooling system; 7. Submit the work reports;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to:

8. Submit whole forms, records and other documents; 9. Arrange and clean the tools, equipment and workplace; 10. Store the tools, equipment and safety device properly.	1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Clean and change the cooling pump and the oil filtration of the lathe cooling system (strainer); 1.4 Clean and change the cutting fluid pool of the lathe cooling system and cooling fluid. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Working principle and composition of the hydraulic/pneumatic system; 3.2 Variety, functions and structure principle of hydraulic/pneumatic elements; 3.3 Cleaning and installation of hydraulic/pneumatic elements. 4.0 Essential Skills 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The hydraulic/pneumatic system elements are changed according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties

	4. Occupational safety and health.

OCCUPATION	MECHANICAL EQUIPMENT MAINTENANCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	REPAIRING OF HYDRAULIC/PNEUMATIC ELEMENTS	**DUTY NO.**	506
TASK TITLE	PATCHING OF HYDRAULIC/PNEUMATIC SYSTEM FITTINGS	**TASK NO.**	5062
PERFORMANCE CRITERIA	The person performing this task must be able to patch the fittings of hydraulic/pneumatic system according to this standard and procedures.		
RANGE STATEMENT	The task can be performed in the training factory under the supervision of senior technicians or mechanical engineers. The equipment and tools to be used include: 1. Operation equipment (work tables and bench vices); 2. Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches); 3. Screwdrivers (straight screwdrivers and cross-head screwdrivers); 4. Pliers (wire cutter, needle-nose pliers and circlip pliers); 5. Measuring tools (vernier calipers and steel rulers); 6. Auxiliary tools (expanders, pipe cutters, high pressure hoses, pipe joints, lubricating oil and chemical fiber fabrics).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose suitable tools, safety device, materials and equipment for the task; 2. Obtain the detailed information of task; 3. Ensure the oil line of the lathe lubricating system is unblocked; 4. Ensure the pipeline of the lathe lubricating system is unblocked, intact and firm; 5. Connect with high pressure hose joint; 6. Connect with the hydraulic/pneumatic system piping of the lathe;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable tools, safety device, materials and equipment; 1.2 Obtain the detailed information of task; 1.3 Ensure the oil line of the lathe lubricating system is unblocked; 1.4 Ensure the pipeline of the lathe cooling system is unblocked; 1.5 Adopt high pressure hose joint and fittings of the hydraulic/pneumatic system of the lathe. **2.0 Principle**

7. Submit the work reports; 8. Submit whole forms, records and other documents; 9. Arrange and clean the tools, equipment and workplace; 10. Store the tools, equipment and safety device properly.	The person performing this task must be able to explain the following principles: 2.1 Principle of good manufacturing practice (GMP); 2.2 Principle of Hazard Analysis and Critical Control Point (HACCP); 2.3 Principle of standard operation procedure (SOP). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Classification and model of hydraulic/pneumatic oil pipes; 3.2 Connection of oil pipes and pipe joints. **4.0 Essential Skills** 4.1 Calculative skills; 4.2 Communication skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The hydraulic/pneumatic system fittings are patched according to approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation equipment and tools; 2. Standard of international standardization organization (ISO); 3. Scope of duties 4. Occupational safety and health.

TABLE 1: DACUM CHARTS FOR MECHANICAL EQUIPMENT MAINTENANCE ENGINEER - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Ordinary cutting equipment installation	1.1 Positioning of the medium-sized general-purpose equipment. 1.2 Fixing of the medium-sized general-purpose equipment.	**General skills and knowledge** · Mechanical drafting and reading · Tolerance Fit and Technical Measurement; · Basic operations · Common materials and metal thermal treatment · Machining process and basics · Fitter foundation · Electrician foundation · Hydraulic (pneumatic) pressure · Safety and civilized construction and environmental protection · Quality management · Equipment installation and civil engineering · Parts drawings and assembly drawings · DC/AC circuit · Electric drive · Lifting and hoisting · Mechanical stabilization · Engineering mechanics · Material science · Pouring process **Tools and equipment** · Necessary tools, clamps, measuring and auxiliary tools for mechanical equipment installation; · Lathes · PPE such as safety boots, googles, gloves, hearing protection device and safety helmet

DUTIES	TASKS	ENABLERS
		Materials · Mechanical equipment · Mechanical elements · Installation drawings of mechanical equipment **Requirements for employees** · Teamwork · Communication skills · Honesty and integrity · Time management
2.0 Ordinary cutting equipment debugging	2.1 Adjustment of the accuracy of medium-sized general-purpose equipment installations. 2.2 Commissioning of the medium-sized general-purpose equipment.	**General skills and knowledge** · Classification of production system · Quality guarantee · Control the quality · Operation of different machining equipment · Technology for improving productivity · Material science · Basic mechanics · Basic electrical engineering · Manual and automatic operation of the lathe · Machine operation frequency · Basic electrical control · Hydraulic transmission **Tools and equipment** · Necessary tools, clamps, measuring and auxiliary tools for mechanical equipment installation; · Lathes · PPE such as safety boots, googles, gloves, hearing protection device and safety helmet

DUTIES	TASKS	ENABLERS
		Materials · Mechanical equipment · Mechanical elements · Installation drawings of mechanical equipment **Requirements for employees** · Teamwork · Communication skills · Honesty and integrity · Time management
3.0 Process mechanical equipment components	3.1 Stereo scribing. 3.2 Sawing, file cutting and chipping. 3.3 Machining of the holes and the threads.	**General skills and knowledge** · Calculative skills · Communication skills · Customer service skills · Teamwork skills · Report writing skills · Circumstantial knowledge of scribing workpiece in complicated shapes · Circumstantial knowledge for selecting scribing reference · Circumstantial knowledge of alignment and material borrowing · Sharpening and selection of different chisels · Circumstantial knowledge of chipping · Circumstantial knowledge of sawing · Circumstantial knowledge of file cutting · Geometric tolerance and measurement skills · Circumstantial knowledge on cutting characteristics of

DUTIES	TASKS	ENABLERS
		standard twist drill and sharpening · Circumstantial knowledge of drilling · Circumstantial knowledge of thread machining · Circumstantial knowledge of tap fracture treatment **Tools and equipment** · Operation equipment (work table, bench vice, electric hand drill, bench drilling machine and grinding machine) · Scribing tools (scribing platform, square box, V-shaped block, scribing needle/compass, steel plate ruler, height Vernier caliper and sample punching pin) · Fitter's tools (chisel, hammer, saw bow, saw blade, file, center drill, twist drill, tap and tap wrench) · Measuring tools (steel tape, Vernier caliper, universal bevel protractor, knife straight edge, 90° angle ruler and feeler gauge) **Materials** · Box body · Lathe bed · Bearing shell · 45# steel part · Coating of scribing **Requirements for employees** · Teamwork · Communication skills · Honesty and integrity

DUTIES	TASKS	ENABLERS
		· Time management
4.0 Diagnosis of the faults of ordinary cutting equipment	4.1 Diagnosis of the faults of the medium-sized general-purpose equipment.	**General skills and knowledge** · Calculative skills · Communication skills · Customer service skills · Teamwork skills · Report writing skills · Structure and working principle of lathes, milling machiness and shaping machines; · Common faults of lathes, milling machiness and shaping machines. · Circumstantial knowledge on geometric precision of lathe, boring and shaping machine and the relationship with machining precision · Geometric accuracy detection of lathes, milling machiness and shaping machines and use of relevant instruments · Data processing of experiments measured on the geometric accuracy of lathes, milling machines and shaping machines · Working accuracy of lathes, milling machines and shaping machines · Working accuracy detection of lathes, milling machiness and shaping machines and use of the relevant instruments · Data processing of experiments measured on the working accuracy of lathes, milling machines and shaping machines **Tools and equipment**
	4.2 Detection of geometric accuracy of medium-sized general-purpose equipment with general measuring tools.	
	4.3 Detection of the working accuracy of medium-sized general-purpose equipment with the trial processing method.	

DUTIES	TASKS	ENABLERS
		· Operation equipment (lathes, milling machines and shaping machines) · Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches) · Screwdrivers (straight screwdrivers and cross-head screwdrivers) · Pliers (wire cutter, needle-nose pliers and circlip pliers) · Knocking tools (hammers and copper rods); · Electric tools (electric hand drill, angle grinder and straight grinder) · Special tools (crow bars and pullers) · Measuring tools (micrometer, level gauge, gauge block, dial gauge and magnetic meter stand) · Detection tools (coupled image level, dial gauge, magnetic meter stand, steel ruler, standard sample, long cylindrical test bar and special precision detection tools) **Materials** · Lathes · Milling machine · Shaping Machines · 45# steel part **Requirements for employees** · Teamwork · Communication skills

DUTIES	TASKS	ENABLERS
		· Honesty and integrity · Time management
5.0 Maintenance of drive mechanism	5.1 Maintenance of the belt and wheel drive mechanism. 5.2 Maintenance of the wheel drive mechanism. 5.3 Repairing of screw drive mechanism.	**General skills and knowledge** · Calculative skills · Communication skills · Customer service skills · Teamwork skills · Report writing skills · Variety of belt drive mechanism and fixing mode between belt wheel and shaft · Installation of belt drive mechanism and belt wheels · Wear and correction of V-shaped belt characteristics and assembly technology of gear drive mechanism · Assembly between gears and shafts as well as gear shaft assembly and box body · Gear repair · Characteristics and assembly technology of screw drive mechanism · Assembly and adjustment of screw drive mechanism · Repairing of screw drive mechanism **Tools and equipment** · Operation equipment (CA6140 lathe and flat nose pliers) · Detection tools (dial gauges and magnetic meter stands) · Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches)

DUTIES	TASKS	ENABLERS
		· Screwdrivers (straight screwdrivers and cross-head screwdrivers) · Knocking tools (hammers and copper rods) · Fitter's tools (files, electric hand drills, drill bits and reamers) · Auxiliary tools (crow bar) **Materials** · CA6140 lathe · Four B2134 new V-shaped belts · Change gear (Z1=64, 2=100 and Z3=97) · Flat-nose pliers · Lacquer tray · Abrasive paper · Clean cotton yarn · Clean kerosene · Oil **Requirements for employees** · Teamwork · Communication skills · Honesty and integrity · Time management
6.0 Repairing of hydraulic/pneumatic elements	6.1 Replacement of hydraulic/pneumatic system elements. 6.2 Patching of hydraulic/pneumatic system fittings.	**General skills and knowledge** · Calculative skills · Communication skills · Customer service skills · Teamwork skills · Report writing skills · Working principle and composition of the hydraulic/pneumatic system · Variety, functions and structure principle of hydraulic/pneumatic elements

DUTIES	TASKS	ENABLERS
		· Cleaning and installation of hydraulic/pneumatic elements · Classification and model of hydraulic/pneumatic oil pipes · Connection of oil pipes and pipe joints **Tools and equipment** · Operation equipment (work tables and bench vices) · Wrenches (open-end wrenches, box-end wrenches, monkey wrenches, inner hexagon wrenches, torque wrenches, socket wrenches and special wrenches) · Screwdrivers (straight screwdrivers and cross-head screwdrivers) · Pliers (wire cutter, needle-nose pliers and circlip pliers) · Measuring tools (vernier calipers and steel rulers) · Auxiliary tools (expander and pipe cutter) **Materials** · CA6140 lathe · Lubricating oil · Chemical fiber fabrics · Cooling pump · Oil filter (strainer) · Cutting fluid pool · Cutting fluid · High-pressure hose · Tube joint **Requirements for employees** · Teamwork

DUTIES	TASKS	ENABLERS
		· Communication skills · Honesty and integrity · Time management