NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

MAY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: METROLOGY TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

A	Ampere
CBET	Competency Based Education and Training
CD	Candela
K	Kelvin
Kg	Kilogram
M	Meter
Mol	Mole
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
S	Second
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 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 and Vocational Education and Training of Tanzania 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 Occupational 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 circuits, performs fault 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 Metrology 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 experts 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 Metrology Technicians were key informants in the survey to discover occupational trends. The 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 METROLOGY TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Metrology 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 Metrology 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.

Metrology Technicians are supervised by Metrology Engineers to inspect, use, calibrate, repair, verify, and maintain measuring instruments and systems. In the metrology room, technicians can apply metrological standards and standardization skills to promote quality control and conformity assessment. Generally, the Metrology Technician performs the following responsibilities:

a) Measurement of geometric quantities

b) Measurement of mechanical quantities

c) Measurement of temperature quantities

d) Measurement of electromagnetic quantities

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

4.0. VALID 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 METROLOGY TECHNICIAN - NTA 5

<table>
<tr><td>OCCUPATION</td><td>METROLOGY TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>MEASUREMENT OF GEOMETRIC QUANTITIES</td><td>DUTY NO.</td><td>501</td></tr>
<tr><td>TASK TITLE</td><td>CALIBRATION OF WORK LINEAR SCALE</td><td>TASK NO.</td><td>5011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to calibrate the linear scale, steel tape, steel ruler, fiber tape, measuring rope, casing ruler, and cable length meter in accordance with technical requirements, and report the calibration results.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer.
The tools and equipment to be used include:
1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol;
2. Temperature and humidity indicator;
3. Standard steel tape;
4. Standard metal linear scale;
5. Reading microscope;
6. Feeler gauge;
7. Workbench;
8. Intelligent length measuring instrument;
9. Steel tape.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Wear personal protective equipment such as gloves, and use cleaning tools such as alcohol to clean standard and measured instruments;
2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement;
3. Use a standard steel tape as the main standard instrument to measure the indication error of steel tapes, fiber tapes, and measuring ropes;
4. Use a standard metal linear scale as the main standard instrument to measure the indication error of a steel ruler;
5. Use a reading microscope to read the line width and the deviation of ruler readings;
6. Use a feeler gauge to measure the</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Check the appearance of linear measuring instruments;
1.2 Adjust the workbench and correctly clamp it;
1.3 Maintain standard instruments and supporting equipment.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 The working principle of linear measuring instruments;
2.2 The working principle of standard metrological instruments.</td></tr>
</table>

flatness of a linear scale and a steel ruler; 7. Use a steel tape and an intelligent length measuring instrument to record the standard length value for measuring the indication error of the cable length meter; 8. Use the workbench to correctly place the measured linear scale, steel tape, steel ruler, fiber tape, and measuring rope.	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of linear measuring instruments; 3.2 Requirements for working environment conditions for verification and calibration of linear measuring instruments; 3.3 Requirements for the storage environment of linear measuring instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of linear measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	GAUGE BLOCK CALIBRATION	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the gauge block in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Temperature and humidity indicator; 3. Gauge block; 4. Contact interferometer or gauge block comparator; 5. Length measuring instrument or length measuring machine; 6. Optical meter; 7. Plane optical flat.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured length and end measuring instruments; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Use a contact interferometer, gauge block comparator, length measuring instrument, length measuring machine, and vertical optical meter to read the deviation between the measured gauge block and the standard gauge block; 6. Use a plane optical flat to measure the grindability of the gauge block; 7. Clean and store measuring tools.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of length and end measuring instruments; 1.2 Place clamping length and end measuring instruments; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of length and end measuring instruments; 2.2 The working principle of standard metrological instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of length and end measuring instruments;

	3.2 Requirements for working environment conditions for verification and calibration of length and end measuring instruments; 3.3 Requirements for the storage environment of length and end measuring instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of length and end measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF CONVENTIONAL ANGLE MEASURING INSTRUMENTS	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the goniometer, level gauge, autocollimator, optical digital indexing head, small angle inspection instrument, tool presetting measuring instrument, and optical digital indexing table in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Temperature and humidity indicator; 3. Regular polygonal prism; 4. Gauge block; 5. Level calibrator; 6. Small angle inspection instrument; 7. Autocollimator; 8. Knife straightedge; 9. Indicator; 10. Mandrel.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured angle measuring instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Use a regular polygonal prism as a standard instrument, combined with an autocollimator, for measuring the indication error of goniometer, optical digital indexing head, and optical digital	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of the angle measuring instrument; 1.2 Place clamping angle measuring instruments; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of angle measuring instruments; 2.2 The working principle of standard metrological instruments.

indexing table; 6. Use a level calibrator to measure the indication error of the level gauge; 7. Use a gauge block to generate small angular changes on a small angle inspection instrument, and measure the indication error of the autocollimator; 8. Use a knife straightedge to measure the flatness of the working surface of small angle inspection instruments and autocollimators; 9. Use a mandrel in conjunction with an indicator to measure the parallelism of the V-groove on the bottom surface of the level gauge, and the indication error of the tool presetting measuring instrument; 10. Clean and store measuring tools.	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of angle measuring instruments; 3.2 Requirements for working environment conditions for verification and calibration of angle measuring instruments; 3.3 Requirements for the storage environment of angle measuring instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of angle measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF SHAPE MEASURING INSTRUMENTS	**TASK NO.**	5014
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the knife straightedge, flat ruler, plane optical flat, flat plate, planar equal thickness interferometer, roundness measuring instrument, and cylindricity measuring instrument in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Temperature and humidity indicator; 3. Gauge block; 4. Milling straight edges; 5. Knife straightedge; 6. Electronic level gauge; 7. Bridge plate; 8. Surface roughness comparison specimen; 9. Planar equal thickness interferometer; 10. Tool microscope; 11. Standard optical flat; 12. Standard cylinder; 13. Standard ellipsometer set.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured shape measuring instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Use a gauge block and a 75mm knife	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance and function of shape measuring instruments; 1.2 Place shape measuring instruments; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of shape measuring instruments;

straightedge to form the subject headings standard, and use it together with milling straight edges as a standard instrument to measure the straightness of the working edge of the knife straightedge; 6. Use the bridge plate, adjust the bridge distance, fix the electronic level gauge on the bridge plate, and measure the straightness of the flat ruler, the parallelism of the upper and lower measuring surfaces, and the flatness of the flat plate; 7. Compare and measure the surface roughness of cast iron straightedge and flat plate using a surface roughness comparison specimen; 8. Measure the flatness of the optical flat working surface using a planar equal thickness interferometer; 9. Measure the indication error of a planar equal thickness interferometer using a standard optical flat; 10. Measure the cylindricity measurement indication error of the cylindricity measuring instrument using a standard roundness measuring instrument; 11. Measure the roundness indication error of roundness and cylindricity measuring instruments using a standard ellipsometer set; 12. Clean and store measuring tools.	2.2 The working principle of standard metrological instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of shape measuring instruments; 3.2 Requirements for working environment conditions for verification and calibration of shape measuring instruments; 3.3 Requirements for the storage environment of shape measuring instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of shape measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF VERNIER SPECIES MEASURING TOOLS	**TASK NO.**	5015
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate current calipers and height calipers in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Gauge block; 3. Surface roughness comparison specimen; 4. Tool microscope; 5. Knife straightedge; 6. Flat plate; 7. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured vernier species measuring tools; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Compare and measure the measuring surface roughness of vernier species measuring tools using a surface roughness comparison specimen; 6. Use gauge blocks as standard instruments to measure the indication error of vernier species measuring tools; 7. Use a knife straightedge to measure the flatness of the measuring surface of vernier species measuring tools;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of vernier species measuring tools; 1.2 Properly place clamping vernier species measuring tools and measuring instruments; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of vernier species measuring tools; 2.2 The working principle of standard metrological instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of vernier species

8. Use a tool microscope to measure the line width of vernier species measuring tools; 9. Place depth and height calipers on a flat plate for subsequent measurement; 10. Clean and store measuring tools.	measuring tools; 3.2 Requirements for working environment conditions for verification and calibration of vernier species measuring tools; 3.3 Requirements for the storage environment of vernier species measuring tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of vernier species measuring tools.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF DIFFERENTIAL TYPE MEASURING TOOLS	**TASK NO.**	5016
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the outside micrometer, inside micrometer, lever micrometer, dial gauge micrometer, and lever-type snap gage in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Gauge block; 3. Surface roughness comparison specimen; 4. Tool microscope; 5. Dynamometer; 6. Length measuring machine; 7. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured differential type measuring tools; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Compare and measure the measuring surface roughness of differential type measuring tools using a surface roughness comparison specimen; 6. Use gauge blocks as standard instruments to measure the indication error of differential type measuring tools; 7. Use a dynamometer to measure the force of differential type measuring tools;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of differential type measuring tools; 1.2 Properly place clamping differential type measuring tools and measuring instruments; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of differential type measuring tools; 2.2 The working principle of standard metrological instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of differential type

8. Use a tool microscope to measure the line width of differential type measuring tools; 9. Use a length measuring machine to measure the indication error of an inside micrometer; 10. Clean and store measuring tools.	measuring tools; 3.2 Requirements for working environment conditions for verification and calibration of differential type measuring tools; 3.3 Requirements for the storage environment of differential type measuring tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of differential type measuring tools.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF INDICATOR TYPE MEASURING TOOLS	**TASK NO.**	5017
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate indicators, lever indicators, mechanical comparators, torsional spring comparators, inner diameter gauges, and dial snap gauges in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Gauge block; 3. Surface roughness comparison specimen; 4. Tool microscope; 5. Dynamometer; 6. Standard ring gauge; 7. Temperature and humidity indicator; 8. Indicator tester.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured differential type measuring tools; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Compare and measure the measuring surface roughness of indicator type measuring tools using a surface roughness comparison specimen; 6. Use gauge blocks as standard instruments to measure the indication error of mechanical comparators and torsional spring comparators;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of indicator type measuring tools; 1.2 Properly place clamping indicator type measuring tools; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of vernier species measuring tools; 2.2 The working principle of standard metrological instruments. **3.0 Theories** The person performing this task must be able to

7. Use a dynamometer to measure the force of indicator type measuring tools; 8. Use a tool microscope to measure the line width of indicator type measuring tools; 9. Use a standard ring gauge to measure the variability of the inner diameter gauge indication; 10. Use an indicator tester to measure the indication error and hysterisis error of indicators, lever indicators, and inner diameter gauges; 11. Clean and store measuring tools.	explain the following: 3.1 The usage process of indicator type measuring tools; 3.2 Requirements for working environment conditions for verification and calibration of indicator type measuring tools; 3.3 Requirements for the storage environment of indicator type measuring tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of differential type measuring tools.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MEASUREMENT OF GEOMETRIC QUANTITIES	**DUTY NO.**	501
TASK TITLE	CALIBRATION OF ANGLE MEASURING TOOLS	**TASK NO.**	5018
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate right angle rulers, sine gauges, square boxes, square gauges, angle rulers, and level rulers in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment such as gloves, as well as cleaning tools such as alcohol; 2. Temperature and humidity indicator; 3. Gauge block; 4. Angular gauge block; 5. Level calibrator; 6. Square measuring instrument; 7. Feeler gauge; 8. Knife straightedge; 9. Indicator; 10. Mandrel.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard metrological instruments and supporting equipment that meet the technical requirements, are within the traceability validity period, and are in normal condition; 2. Check the appearance of the measured angle measuring instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Wear protective equipment such as gloves, and use alcohol to clean the metrological instruments being measured; 5. Use angular gauge blocks as standard instruments to measure the indication error of universal angle rulers; 6. Use a level calibrator to measure the indication error of the level gauge; 7. Use a square measuring instrument to	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of angle measuring tools; 1.2 Properly place clamping angle measuring tools; 1.3 Maintain standard instruments and supporting equipment. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of angle measuring instruments; 2.2 The working principle of standard metrological instruments. **3.0 Theories**

measure the angular deviation of a right angle ruler and a directional angle ruler; 8. Use a feeler gauge to measure the flatness of a right angle ruler and a universal angle ruler; 9. Use a knife straightedge to measure the flatness of the working surface of a right angle ruler, level gauge, square box, and square gauge; 10. Use a gauge block to form a 30° standard angle, and use an indicator to measure the indication error of the sine gauge; 11. Use a mandrel and an indicator to measure the parallelism of the V-groove on the bottom surface of the square box and level gauge; 12. Clean and store measuring tools.	The person performing this task must be able to explain the following: 3.1 The usage process of angle measuring tools; 3.2 Requirements for working environment conditions for calibration and verification of angle measuring tools; 3.3 Requirements for the storage environment of angle measuring tools. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills; 5.3 Skills in determining the conformity of results.
DESCRIPTION OF THE END PRODUCT / SERVICE	Verification/Calibration is implemented in accordance with technical specifications to form the measurement results of angle measuring tools.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	CALIBRATION OF MASS INSTRUMENTS	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate mechanical balances and electronic balances in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Weight; 2. Standard weight; 3. Mass comparator; 4. Standard balance; 5. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves, and use cleaning tools such as alcohol to clean weights; 2. Select standard weights with corresponding accuracy levels; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use standard weights and measuring instruments to measure the converted mass of weights; 5. Use weights to measure the unbalance loading error of the electronic balance; 6. Use weights to measure the indication error and repeatability of electronic balances and mechanical balances; 7. Use weights to measure the zero setting accuracy of electronic balances; 8. Use weights to measure the graduation value error and unequal arm error of crossbeam of mechanical balances; 9. Maintain weights.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of the balance and weights; 1.2 Adjust the balance; 1.3 Maintain weights. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of weight measurement; 2.2 The working principle of balances. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of mass instruments; 3.2 Requirements for working environment conditions for verification and calibration of mass instruments; 3.3 Requirements for the storage environment of mass instruments.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of mass measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of safety and environmental protection; 2. Knowledge of quality control; 3. Knowledge of relevant laws and regulations.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF WEIGHING INSTRUMENTS	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate analog indicating scales, digital indicating scales, and automatic weighting instruments in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Weight; 3. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Select weights with appropriate quantities and accuracy levels; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use weights to measure the repeatability and unbalance loading error of digital and analog indicating scales; 5. Use weights to measure the weighing error of digital and analog indicating scales; 6. Use weights to measure the identification threshold of digital and analog indicating scales; 7. Use weights to measure the zero setting accuracy and peeling accuracy of the digital indicating scale; 8. Use weights to measure the weight of the digital indicating scale after peeling; 9. Maintain weights.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of weighing instruments; 1.2 Adjust weighing instruments; 1.3 Maintain weighing instruments. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of weighing instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of weighing instruments; 3.2 Requirements for working environment conditions for weighing instruments; 3.3 Requirements for the storage environment of weighing instruments; 3.4 Safety operation rules for weighing instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills;

	4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of weighing measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF SMALL CAPACITY INSTRUMENTS	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate commonly-used volumetric glasses, pipettes, and liquid material quantitative filling machines in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Second-class standard volumetric glass; 3. Electronic balance; 4. Weight set; 5. Electronic stopwatch; 6. Purified water; 7. Density measuring equipment; 8. Standard measuring instrument set; 9. Weighing device; 10. Temperature and humidity indicator; 11. Precision thermometer; 12. Reading glass.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Use a standard volumetric glass to verify the capacity indication error of measuring cylinders, measuring cups, volumetric flasks, and burets using the comparative method; 4. Use electronic balance and weight set to verify the capacity indication error of measuring cylinders, measuring cups, volumetric flasks, and burets using the measurement method; 5. Measure the tightness of commonly-used volumetric glasses; 6. Use a stopwatch to measure the outflow	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of second-class standard volumetric glass; 1.2 Determine the meniscus and readings; 1.3 Maintain small capacity instruments. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of small capacity instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of small capacity

time of commonly-used volumetric glasses; 7. Use a thermometer to measure the temperature of purified water to determine water density; 8. Use an electronic balance to measure the capacity of the pipette; 9. Use a standard measuring instrument set to measure the filling capacity of a liquid material quantitative filling machine; 10. Use a weighing device to measure the filling capacity of a liquid material quantitative filling machine; 11. Clean and store tools.	instruments; 3.2 Requirements for working environment conditions for small capacity instruments; 3.3 Requirements for the storage environment of small capacity instruments; 3.4 Safety operation rules for small capacity instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of small capacity measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF FORCE VALUE INSTRUMENTS	**TASK NO.**	5024
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate dynamometers for work, force sensors, and universal testing machines in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Force measuring weight; 3. Force standard machine; 4. Standard dynamometer; 5. Coaxiality tester; 6. Stopwatch; 7. Sound level meter; 8. Dial indicator and dial gauge; 9. Extensometer designator; 10. Insulation resistance measuring instrument; 11. Coaxiality specimen.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Select standard instruments with appropriate ranges for the measured force value instruments; 4. Calibrate the indication error and repeatability error of the dynamometer for work using weights/standard dynamometers/force standard machines; 5. Calibrate the zero returning error of the dynamometer for work; 6. Use a force standard machine to calibrate the indication error and repeatability error of the force sensor; 7. Calibrate the zero output and zero drift of the force sensor; 8. Use a standard dynamometer to calibrate	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of force value instruments; 1.2 Adjust the zero position of force value instruments; 1.3 Maintain force value instruments. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of force value instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of force value instruments; 3.2 Requirements for working environment

the indication error and repeatability error of the testing machine; 9. Use a stopwatch to calibrate the zero drift and zero relative error of the testing machine; 10. Use a coaxiality specimen and coaxiality tester to calibrate the coaxiality error of the testing machine; 11. Use force measuring weights to calibrate the discrimination threshold of the testing machine; 12. Use a dial indicator and dial gauge to calibrate the displacement indication error of the crossbeam; 13. Use a dial gauge, dial indicator, and stopwatch to calibrate the movement speed of the testing machine crossbeam; 14. Use an extensometer calibration device to calibrate the extensometer; 15. Use a sound level meter to calibrate the working noise of the testing machine; 16. Use an insulation resistance measuring instrument to calibrate the insulation resistance of the testing machine; 17. Clean and store tools.	conditions for force value instruments; 3.3 Requirements for the storage environment of force value instruments; 3.4 Safety operation rules for force value instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of force value measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF METAL HARDNESS TESTERS	**TASK NO.**	5025
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate Brinell hardness testers, Rockwell hardness testers, and Vickers hardness testers for work in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Brinell hardness tester; 3. Rockwell hardness tester; 4. Vickers hardness tester; 5. Stopwatch; 6. Projector; 7. Tool microscope; 8. Sounding installation tester; 9. Vertical optical meter; 10. Level gauge; 11. Feeler gauge, right angle ruler, and check bar; 12. Standard scale; 13. Micrometer; 14. Dial indicator; 15. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Select appropriate standard hardness blocks; 4. Use a check bar, right angle ruler, and feeler gauge to calibrate the verticality of the metal hardness tester spindle and the test bench surface; 5. Use a level gauge to calibrate the levelness of the metal hardness tester; 6. Use a standard dynamometer to calibrate the test force indication error of the metal	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of metal hardness testers; 1.2 Select and read test force; 1.3 Maintain metal hardness testers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of metal hardness testers. **3.0 Theories**

hardness tester; 7. Use a sounding installation tester to calibrate the indication error of the Rockwell hardness tester and Vickers hardness tester indentation measurement device; 8. Use a tool microscope to calibrate the appearance of the Rockwell hardness tester and Vickers hardness tester indenter, as well as the cone angle of the diamond indenter; 9. Use a standard indenter to calibrate the indication error of the diamond cone indenter of the Rockwell hardness tester; 10. Use a vertical optical meter to calibrate the diameter of the Rockwell hardness tester and the Brinell hardness tester steel ball indenter; 11. Use Rockwell hardness blocks to calibrate the hardness indication error and repeatability error of Rockwell hardness testers; 12. Use Brinell hardness blocks to calibrate the hardness indication error and repeatability error of Brinell hardness testers; 13. Use Vickers hardness blocks to calibrate the hardness indication error and repeatability error of Vickers hardness testers; 14. Use a stopwatch to calibrate the stress application time of the Rockwell hardness tester and the Brinell hardness tester; 15. Use Rockwell hardness blocks and diamond indenters to calibrate the coaxiality of the lifting screw axis and spindle axis of the metal hardness tester; 16. Use a standard scale to measure the indication error of the indentation measurement device; 17. Clean and store measuring tools.	The person performing this task must be able to explain the following: 3.1 The usage process and precautions of metal hardness testers; 3.2 Requirements for the working environment conditions of metal hardness testers; 3.3 Requirements for the storage environment of metal hardness testers; 3.4 Safety operation rules for metal hardness testers. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of metal hardness tester measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures;

	4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF NON-METAL HARDNESS TESTERS	**TASK NO.**	5026
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the rubber hardometer in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Special gauge block; 3. Tool microscope; 4. Vickers hardness tester; 5. Vernier caliper; 6. Dynamometer; 7. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Use a tool microscope to calibrate the surface condition of the rubber hardometer indenter; 4. Use a tool microscope to calibrate the geometric dimensioning of the rubber hardometer indenter; 5. Use a Vickers hardness tester to calibrate the hardness of the rubber hardometer indenter; 6. Use a vernier caliper to calibrate the geometric dimensioning of the rubber hardometer; 7. Use a dynamometer to calibrate the test force indication error of the rubber hardometer; 8. Clean and store measuring tools.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of non-metal hardness testers; 1.2 Select and read dynamometers; 1.3 Maintain non-metal hardness testers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of non-metal hardness testers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process and precautions of non-metal hardness testers; 3.2 Requirements for the working environment conditions of non-metal hardness testers; 3.3 Requirements for the storage environment of non-metal hardness testers; 3.4 Safety operation rules for non-metal hardness

	testers. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of non-metal hardness tester measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MECHANICAL MEASUREMENT	**DUTY NO.**	502
TASK TITLE	MEASUREMENT OF PRESSURE MEASURING INSTRUMENTS	**TASK NO.**	5027
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate pressure gauges, sphygmomanometers, pressure sensors, liquid level gauges, barometric altimeters, and working liquid pressure gauges in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Digital pressure gauge; 3. Piston pressure gauge; 4. Precision pressure gauge; 5. Pressure pump; 6. T-pipe; 7. Stopwatch; 8. DC stabilized voltage and current power supply; 9. Insulation resistance meter; 10. Voltage withstanding tester; 11. Steel tape; 12. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Select appropriate standard instruments for the medium used for the pressure instrument being tested; 4. Use precision pressure gauges, digital pressure gauges, and piston pressure gauges to calibrate pressure gauges, sphygmomanometers, pressure sensors, liquid level gauges, barometric altimeters, and working liquid pressure gauges for pressure indication errors; 5. Calibrate the hysterisis error, friction error, and pointer deflection stability of the pressure gauge;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of pressure measuring instruments; 1.2 Select appropriate measurement medium; 1.3 Maintain pressure measuring instruments. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of pressure measuring instruments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process and precautions of pressure

6. Calibrate the set point deviation and differential gap of the electric-contact pressure gauge; 7. Use a pressure generator and stopwatch to calibrate the sealing of liquid pressure gauges for work; 8. Use an insulation resistance meter to calibrate the insulation resistance of pressure sensors; 9. Use a voltage withstanding tester and insulation resistance meter to calibrate the withstand voltage and insulation resistance of the liquid level gauge; 10. Use a steel tape to calibrate the liquid level error of the liquid level gauge; 11. Clean and store measuring tools.	measuring instruments; 3.2 Requirements for the measurement environment conditions of pressure measuring instruments; 3.3 Requirements for the storage environment of pressure measuring instruments; 3.4 Safety operation rules for pressure measuring instruments. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of pressure measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	TEMPERATURE MEASUREMENT	**DUTY NO.**	503
TASK TITLE	CALIBRATION OF THERMOCOUPLE	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the platinum-rhodium 10-platinum thermocouple for work, and copper-copper nickel thermocouple for work in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard thermocouple; 3. Thermoelectromotive force measuring instrument; 4. Verification furnace; 5. Annealing furnace; 6. Electrical annealing device; 7. Freezing point thermostat; 8. Outside micrometer; 9. Metal ruler; 10. Special workbench; 11. Standard mercury thermometer; 12. Second-class standard platinum resistance thermometer; 13. DC potentiometer; 14. Reading telescope.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Select the appropriate standard instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use anhydrous ethanol to clean the thermocouple, and complete the thermocouple lining and marking; 5. Use an annealing device to conduct electrical annealing on thermocouples; 6. Use an annealing furnace to conduct annealing on thermocouples; 7. Bundle the standard thermocouple and the tested thermocouple into the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of thermocouples; 1.2 Clean thermocouples; 1.3 Weld thermocouples; 1.4 Maintain thermocouples. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of thermocouples; 2.2 The working principle of calibration of thermocouples. **3.0 Theories**

furnace; 8. Connect the tested thermocouple to the thermoelectromotive force measuring instrument; 9. Use a standard instrument to calibrate the thermoelectric characteristics and stability of thermocouples; 10. Use reading glasses to read the temperature of a standard mercury thermometer; 11. Clean and store tools.	The person performing this task must be able to explain the following: 3.1 The usage process of thermocouples; 3.2 The calibration process of thermocouples; 3.3 Requirements for working environment conditions for thermocouples; 3.4 Requirements for the storage environment of thermocouples; 3.5 Safety operation rules for thermocouples; 3.6 Safe use methods for constant temperature baths (including medium). **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of thermocouple measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Underpinning knowledge of production and quality control.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	TEMPERATURE MEASUREMENT	**DUTY NO.**	503
TASK TITLE	CALIBRATION OF GLASS THERMOMETERS	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate glass thermometers for work in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard platinum resistance thermometer; 3. Supporting electrical testing equipment; 4. Standard mercury thermometer; 5. Constant temperature bath; 6. Measured medium; 7. Auxiliary equipment such as cryoscopes, reading devices, and steel rulers; 8. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Select the appropriate standard instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use a reading device to read the thermometer indication; 5. Use a cryoscope to calibrate the freezing point indication of liquid thermometers for work; 6. Use standard thermometers and constant temperature baths to calibrate the indication error of glass liquid thermometers for work; 7. Calibrate the partial immersion thermometer; 8. Clean and store tools.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of glass thermometers for work; 1.2 Use a constant temperature bath to calibrate the glass liquid thermometer for work; 1.3 Make cryoscopes; 1.4 Maintain glass liquid thermometers for work. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The measuring working principle of glass liquid thermometers for work; 2.2 The verification working principle of glass liquid thermometers for work. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of glass liquid thermometers

	for work; 3.2 The subsequent verification process of glass liquid thermometers for work; 3.3 Requirements for working environment conditions for calibration of glass liquid thermometers for work; 3.4 Requirements for the storage environment of glass liquid thermometers for work; 3.5 Safety operation rules for glass liquid thermometers for work; 3.6 Safe use methods for constant temperature baths (including medium). **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of glass liquid thermometer measuring instruments for work.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. National metrological calibration specifications; 2. Methods for using standard metrological instruments; 3. Occupational health and safety; 4. Equipment maintenance procedures; 5. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	TEMPERATURE MEASUREMENT	**DUTY NO.**	503
TASK TITLE	CALIBRATION OF PRESSURE TYPE THERMOMETERS	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the pressure type thermometer in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Second-class standard mercury thermometer; 3. Reading system; 4. Freezing point bath; 5. Constant temperature bath; 6. Measured medium; 7. Insulation resistance meter; 8. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Select the appropriate standard instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use a reading device to read the thermometer indication; 5. Use a cryoscope to calibrate the freezing point indication of a pressure type thermometer; 6. Use standard thermometers and constant temperature baths to calibrate the indication error of pressure type thermometers; 7. Use an insulation resistance meter to calibrate the insulation resistance of pressure type thermometers; 8. Calibrate the set point error, switching error, and alarm set point error of pressure type thermometers;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of pressure type thermometers; 1.2 Use a constant temperature bath to calibrate pressure type thermometers; 1.3 Make cryoscopes; 1.4 Maintain pressure type thermometers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The measuring working principle of pressure type thermometers; 2.2 The verification working principle of pressure type thermometers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of pressure type thermometers;

9. Clean and store tools.	3.2 The subsequent verification process of pressure type thermometers; 3.3 Requirements for working environment conditions for calibration of pressure type thermometers; 3.4 Requirements for the storage environment of pressure type thermometers; 3.5 Safety operation rules for pressure type thermometers; 3.6 Safe use of constant temperature baths (including medium). 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of pressure type thermometer measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. National metrological calibration specifications; 2. Methods for using standard metrological instruments; 3. Occupational health and safety; 4. Equipment maintenance procedures; 5. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	TEMPERATURE MEASUREMENT	**DUTY NO.**	503
TASK TITLE	CALIBRATION OF INDUSTRIAL PLATINUM AND COPPER THERMISTORS	**TASK NO.**	5034
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate industrial platinum and copper thermistors in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard platinum resistance thermometer; 3. Electric measuring instrument; 4. Change-over switch; 5. Freezing point bath; 6. Constant temperature bath; 7. High temperature furnace; 8. Triple point of water cell and its insulation container; 9. Liquid nitrogen Dewar flask or liquid nitrogen comparator; 10. Insulation resistance meter.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Select the appropriate standard instrument; 3. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 4. Use an insulation resistance meter to calibrate the insulation resistance of industrial platinum and copper thermistors; 5. Use a freezing point bath to calibrate the stability of industrial platinum and copper thermistors; 6. Use electric measuring instruments to measure the resistance values of industrial platinum and copper thermistors; 7. Calculate the calibration results of	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of industrial platinum and copper thermistors; 1.2 Measure the resistance values of industrial platinum and copper thermistors; 1.3 Maintain industrial platinum and copper thermistors. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of industrial platinum and copper thermistors; 2.2 The calibration working principle of industrial platinum and copper thermistors. **3.0 Theories** The person performing this task must be able to

industrial platinum and copper thermistors; 8. Clean and store tools.	explain the following: 3.1 The usage process of industrial platinum and copper thermistors; 3.2 The calibration process of industrial platinum and copper thermistors; 3.3 Requirements for working environment conditions for industrial platinum and copper thermistors; 3.4 Requirements for the storage environment of industrial platinum and copper thermistors; 3.5 Safety operation rules for industrial platinum and copper thermistors; 3.6 Safe use of constant temperature baths (including medium). **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of industrial platinum and copper thermistor measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. National metrological calibration specifications; 2. Methods for using standard metrological instruments; 3. Occupational health and safety; 4. Equipment maintenance procedures; 5. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	THERMAL MEASUREMENT	**DUTY NO.**	503
TASK TITLE	CALIBRATION OF MEDICAL ELECTRONIC THERMOMETERS	**TASK NO.**	5035
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the medical electronic thermometer in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard thermometer; 3. Standard platinum resistance thermometer; 4. Electrical testing equipment; 5. Constant temperature bath; 6. Triple point of water cell and standard set-up; 7. Cryoscope, and ice-making and deicing device; 8. Reading telescope.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear personal protective equipment such as gloves; 2. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 3. Use a reading telescope to read the standard thermometer indication; 4. Use a freezing point bath to calibrate the zero position of the standard instrument; 5. Use a constant temperature bath to calibrate the indication error of an electronic thermometer; 6. Calibrate the maximum value maintenance function of the electronic thermometer; 7. Calibrate the memory function of the electronic thermometer; 8. Calibrate the automatic shutdown function of the electronic thermometer;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the appearance of medical electronic thermometers; 1.2 Use medical electronic thermometers; 1.3 Maintain medical electronic thermometers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of medical electronic thermometers; 2.2 The calibration working principle of medical electronic thermometers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The usage process of medical electronic thermometers; 3.2 The calibration process of medical electronic thermometers;

9. Clean and store tools.	3.3 Requirements for working environment conditions for medical electronic thermometers; 3.4 Requirements for the storage environment of medical electronic thermometers; 3.5 Safety operation rules for medical electronic thermometers; 3.6 Safe use of constant temperature baths (including medium). **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of medical electronic thermometer measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. National metrological calibration specifications; 2. Methods for using standard metrological instruments; 3. Occupational health and safety; 4. Equipment maintenance procedures; 5. Knowledge of safety and environmental protection.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF DC RESISTORS	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate DC resistors, DC resistance boxes, and DC bridges in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Resistor calibration device; 3. Insulation resistance meter; 4. Oil slot; 5. Thermometer; 6. Low thermal potential testing line; 7. Temperature and humidity indicator; 8. Standard resistor.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a resistor calibration device with the corresponding accuracy level; 2. Check the appearance of the measured DC resistance instrument; 3. Record the on-site environmental conditions; 4. Connect the wiring required by the verification regulations; 5. Select measurement points for experiments; 6. Process the measured data; 7. Maintain the equipment used; 8. Clean the workplace; 9. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select the resistor calibration device; 1.2 Process the data from measurement results; 1.3 Store and maintain standard resistors. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of standard resistor measurement. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Temperature control requirements for different levels of standard resistance laboratories; 3.3 Maintenance methods for DC resistors; 3.4 Precautions for using standard resistors; 3.5 Verification regulations for DC resistance boxes.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of DC resistors.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF DC LOW RESISTANCE METERS	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the DC low resistance meter in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Resistance meter; 3. Standard resistance box; 4. Insulation resistance meter; 5. Voltage tester; 6. Electronic stopwatch; 7. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a resistor calibration device with the corresponding accuracy level; 2. Check the appearance and power-on of the measured resistance meter; 3. Record the on-site environmental conditions; 4. Connect the wiring required by the verification regulations; 5. Select measurement points for experiments; 6. Process the measured data; 7. Maintain the equipment used; 8. Clean the workplace; 9. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Measuring methods for insulation resistance; 1.2 Measuring methods for power frequency withstand voltage; 1.3 Data processing methods for measurement results; 1.4 Maintenance methods for resistance meters. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of resistance meters; 2.2 The selecting principle of standard resistance boxes. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Precautions for using resistance meters; 3.3 Maintenance methods for resistance meters.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of DC low resistance meters.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF DC POTENTIOMETERS	**TASK NO.**	5043
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the DC potentiometer in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard potentiometer; 3. Insulation resistance tester; 4. Voltage tester; 5. Thermometer; 6. Low thermal potential testing line; 7. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard potentiometers with corresponding accuracy levels; 2. Check the appearance of the measured DC potentiometer; 3. Record the on-site environmental conditions; 4. Connect the wiring according to the verification regulations; 5. Measure the insulation resistance performance of the measured DC potentiometer; 6. Test the dielectric strength of the measured DC potentiometer; 7. Check the adjustment device inside the measured DC potentiometer; 8. Select measurement points of indication errors for experiments; 9. Process the measured data; 10. Maintain the equipment used; 11. Clean the workplace; 12. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select the DC potentiometer calibration device; 1.2 Compare the basic errors of DC potentiometer indication; 1.3 Process data on measurement errors of DC potentiometers; 1.4 Store and maintain DC potentiometers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of DC potentiometers; 2.2 The selecting principle of standard potentiometers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Precautions for using DC potentiometers; 3.3 Verification regulations for DC potentiometers.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of DC potentiometers.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF DC RESISTANCE VOLTAGE DIVIDERS	**TASK NO.**	5044
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the DC resistance voltage divider in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard voltage divider; 3. DC digital voltmeter; 4. Standard DC voltage generator; 5. Insulation resistance tester; 6. Voltage tester; 7. Thermometer; 8. Low thermal potential testing line; 9. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select standard voltage dividers, DC digital voltmeters, and standard DC voltage generators with corresponding accuracy levels; 2. Check the appearance of the measured DC resistance voltage divider; 3. Record the on-site environmental conditions; 4. Connect the wiring required by the verification regulations; 5. Measure the insulation resistance performance of the measured DC resistance voltage divider; 6. Test the power frequency withstand voltage of the measured DC resistance voltage divider; 7. Select measurement points for basic errors of voltage dividers for experiments; 8. Process the measured data; 9. Maintain the equipment used;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select the calibration device of DC resistance voltage divider; 1.2 Measure the basic errors of the indication of the DC resistance voltage divider; 1.3 Complete the measurement of the basic error of the indication of the DC resistance voltage divider for docking; 1.4 Process data on measurement errors of DC resistance voltage dividers; 1.5 Store and maintain DC resistance voltage dividers. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of DC resistance voltage dividers; 2.2 The selecting principle of standard voltage

10. Clean the workplace; 11. Store the equipment used.	dividers. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Verification regulations for DC resistance voltage dividers; 3.3 Precautions for using DC resistance voltage dividers. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of DC resistance voltage dividers.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF MULTI-FUNCTION DIGITAL INSTRUMENTS	**TASK NO.**	5045
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the digital multimeter in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Multi-function standard source; 3. Multi-function standard meter; 4. Multimeter; 5. Low thermal potential testing line; 6. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a multi-function standard meter and multi-function standard source with corresponding accuracy levels; 2. Check the appearance and power-on of the measured digital multimeter; 3. Measure whether the power supply voltage meets the instrument power supply requirements; 4. Record the on-site environmental conditions; 5. Connect the wiring required by the verification regulations; 6. Select measurement points for experiments; 7. Measure the indication error of a digital multimeter; 8. Maintain the equipment used; 9. Clean the workplace; 10. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the standard meter method to measure the indication error of a digital multimeter; 1.2 Use the standard source method to measure the indication error of a digital multimeter. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of digital multimeter measurement; 2.2 The selecting principle of a multi-function standard meter and multi-function standard source; 2.3 The selecting principle of a calibration point; 2.4 The calibration specifications for digital multimeters. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications;

	3.2 Precautions for using digital multimeters. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of digital multimeter measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF RESISTANCE STRAIN GAUGES	**TASK NO.**	5046
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the resistance strain gauge in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Standard analog strain calibrator; 3. Digital voltmeter; 4. Standard signal generator; 5. Strain gauge frequency response tester; 6. AC resistance box; 7. Thermometer; 8. Low thermal potential testing line; 9. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a standard analog strain calibrator with the corresponding accuracy level; 2. Check the appearance of the measured resistance strain gauge; 3. Record the on-site environmental conditions; 4. Conduct preheating; 5. Connect the wiring required by the verification regulations; 6. Balance the zero position of the measured resistance strain gauge; 7. Measure the indication error of the measured resistance strain gauge; 8. Measure the sensitivity coefficient (K) indication error of the measured resistance strain gauge; 9. Measure the stability of the measured resistance strain gauge; 10. Process the measured data; 11. Maintain the equipment used;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select the standard analog strain calibrator; 1.2 Use the compensation method to measure the basic error of the pointer type resistance strain gauge; 1.3 Use the substitution method to measure the calibration value error of a dynamic resistance strain gauge; 1.4 Use the compensation method to measure the calibration value error of a dynamic resistance strain gauge; 1.5 Store and maintain resistance strain gauges. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of static resistance strain gauge; 2.2 The working principle of dynamic resistance

12. Clean the workplace; 13. Store the equipment used.	strain gauge; 2.3 The selecting principle of standard analog strain calibrators; 2.4 The verification regulations for resistance strain gauges. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Precautions for using resistance strain gauges. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of resistance strain gauges.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF AC PARAMETER INSTRUMENTS	**TASK NO.**	5047
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the ammeter, voltmeter, power meter, resistance meter, and AC digital power meter in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Multi-function standard source; 3. Digital multimeter; 4. Multimeter; 5. Low thermal potential testing line; 6. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a standard meter and multi-function standard source with corresponding accuracy levels; 2. Check the appearance and power-on of the measured AC parameter instrument; 3. Measure whether the power supply voltage meets the instrument power supply requirements; 4. Record the on-site environmental conditions; 5. Connect the wiring required by the verification regulations; 6. Select measurement points for experiments; 7. Measure the indication error of an AC parameter instrument; 8. Maintain the equipment used; 9. Clean the workplace; 10. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the standard meter method to measure the indication error of an AC parameter instrument; 1.2 Use the standard source method to measure the indication error of an AC parameter instrument. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of AC parameter instrument measurement; 2.2 The selecting principle of a standard electric meter and standard source; 2.3 The selecting principle of a calibration point. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Verification regulations for ammeters, voltmeters, power meters and resistance meters; 3.3 Precautions for using an AC parameter table.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of AC parameter instrument measuring instruments.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF ELECTRIC ENERGY METERS	**TASK NO.**	5048
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate electromechanical AC electric energy meters, and electronic AC electric energy meters in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Three-phase power standard source; 3. Voltage tester; 4. Thermometer; 5. Low thermal potential testing line; 6. Temperature and humidity indicator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select a three-phase power standard source with the corresponding accuracy level; 2. Check the appearance of the measured electric energy meter; 3. Record the on-site environmental conditions; 4. Connect the wiring required by the verification regulations; 5. Test the alternating voltage of the measured electric energy meter; 6. Test the shunt running of the measured electric energy meter; 7. Test the start of the measured electric energy meter; 8. Measure the basic errors of the measured electric energy meter; 9. Process the measured data; 10. Maintain the equipment used; 11. Clean the workplace; 12. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the standard meter method to measure the basic error of the electric energy meter; 1.2 Use the Watt-second method to measure the basic error of the electric energy meter; 1.3 Use the pulse method to read the instrument constant; 1.4 Use the counter test method to test the instrument constant; 1.5 Store and maintain electric energy meters. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of electromechanical AC electric energy meters; 2.2 The working principle of electronic AC electric energy meters. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Basic knowledge of electrical applications; 3.2 Precautions for using electric energy meters; 3.3 Verification regulations for electric energy meters. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of electric energy meters.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	ELECTROMAGNETIC MEASUREMENT	**DUTY NO.**	504
TASK TITLE	MEASUREMENT OF AC CHARGING PILES FOR ELECTRIC VEHICLES	**TASK NO.**	5049
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate AC charging piles for electric vehicles in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Personal protective equipment, such as safety shoes, and gloves; 2. Charging pile calibration device; 3. Electronic load; 4. Insulation resistance tester; 5. Thermometer; 6. Low thermal potential testing line; 7. Reference clock (electronic stopwatch).		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check the appearance and display function of the measured charging pile; 2. Record the on-site environmental conditions; 3. Connect the wiring required by the verification regulations; 4. Select the test load point; 5. Verify the working error of the measured charging pile; 6. Verify the clock time error of the measured charging pile; 7. Process the measured data; 8. Maintain the equipment used; 9. Clean the workplace; 10. Store the equipment used.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Verify the working error of the real-load charging pile; 1.2 Verify the working error of the virtual-load charging pile; 1.3 Maintain charging piles. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of charging pile calibration; 2.2 The selecting principle of test load points. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Calibration regulations for AC charging piles for electric vehicles;

	3.3 Precautions for usage and maintenance of charging piles. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Error calculation skills; 5.2 Statistical processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of AC charging piles for electric vehicles.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of standard instruments; 2. Occupational health and safety; 3. Equipment maintenance procedures; 4. Knowledge of safety and environmental protection; 5. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF HIGH-FREQUENCY VOLTAGE	**TASK NO.**	5051
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate RF voltmeters and LF voltmeters in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. AC standard voltage source; 3. HF standard voltage source; 4. LF standard voltmeter; 5. LF signal generator; 6. Supporting adapter and testing cable; 7. Temperature and humidity indicator; 8. Verification/Calibration instrument: RF voltmeter and LF voltmeter.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Select a standard voltage source with the corresponding accuracy level based on the frequency measurement range and accuracy level of the measured voltmeter; 3. Check the basic appearance of the measured voltmeter switches, buttons, knobs, etc.; 4. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 5. Connect the testing cable and adapter; 6. Read the voltage indication of the standard source and the measured voltmeter, and complete the basic voltage error verification; 7. Read the frequency indication of the standard source and the measured voltmeter, and complete the additional frequency error verification;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the standard meter method for measuring the additional frequency error of a voltmeter; 1.2 Use a RF voltmeter for basic voltage error data processing; 1.3 Use a RF voltmeter for additional frequency error data processing; 1.4 Store and maintain the RF voltmeter and LF voltmeter. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a RF voltmeter; 2.2 The selecting principle of standard voltage sources and standard voltmeters. **3.0 Theories** The person performing this task must be able to explain the following:

8. Complete the measured data processing of various indicators; 9. Maintain the equipment used; 10. Clean the workplace; 11. Store the equipment used.	3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using RF voltmeters and LF voltmeters. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of RF voltmeters and LF voltmeters.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of RF voltmeters and LF voltmeters; 2. Safety operation of standard instruments; 3. Verification regulations for RF voltmeters and LF voltmeters; 4. Occupational health and safety; 5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF PULSE POWER METERS	**TASK NO.**	5052
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the pulse power meter in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Signal generator; 3. Pulse signal generator; 4. Vector network analyzer and supporting calibration kit; 5. Power seat I; 6. Power seat II; 7. Step attenuator; 8. Digital voltmeter; 9. Power divider; 10. Isolator; 11. Coaxial testing cable and supporting adapter; 12. Temperature and humidity indicator; 13. Verification/Calibration instrument: pulse power meter.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the pulse power meter being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured pulse power meter switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of the measured pulse power meter, and correctly complete basic functional checks such as power-on preheating and self-check of the measured instrument; 5. Read the temperature and humidity	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the transfer standard method for measuring the calibration factor of the power sensor of the pulse power meter; 1.2 Use the alternating comparative method for measuring the calibration factor of the power sensor of the pulse power meter; 1.3 Use the power sensor of a pulse power meter for voltage standing wave ratio measurement data processing; 1.4 Use the power sensor of a pulse power meter for calibration factor measurement data processing; 1.5 Store and maintain pulse power meters.

indicator, and record the temperature and humidity during on-site measurement; 6. Connect the testing cable and adapter; 7. Use the vector network analyzer calibration kit to complete the network analyzer self-calibration; 8. Read the indication of the tested power meter and vector network analyzer, and complete the voltage standing wave ratio measurement of the power sensor; 9. Read the indication of the tested power meter and standard power seat, and complete the calibration factor measurement of the power sensor; 10. Set and adjust the pulse signal generator, read the indication of the tested power meter, and complete the measurement of pulse rise time and fall time; 11. Read the indication of the tested power meter and standard power meter, and complete the linearity measurement of the power sensor of the tested pulse power meter; 12. Read the indication of the tested power meter and standard voltmeter, and complete the measurement of the output power of the built-in standard source of the measured pulse power meter; 13. Complete the measured data processing of various indicators; 14. Maintain the equipment used; 15. Clean the workplace; 16. Store the equipment used.	**2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a pulse power meter; 2.2 The selecting principle of a standard instrument group. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using pulse power meters. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of pulse power meters.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of pulse power meters; 2. Safety operation of standard instruments; 3. Verification regulations for pulse power meters; 4. Occupational health and safety; 5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF RF AND MICROWAVE POWER AMPLIFIERS	**TASK NO.**	5053
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate RF and microwave power amplifiers in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Signal source I; 3. Signal source II; 4. Standard power meter; 5. Standard medium-power meter; 6. Monitoring power meter; 7. Attenuator; 8. Spectrum analyzer; 9. Directional coupler I; 10. Directional coupler II; 11. Matched load; 12. Power divider; 13. Noise source; 14. Noise coefficient analyzer; 15. Multiplexer; 16. Vector network analyzer and supporting calibration kit; 17. Coaxial testing cable and supporting adapter; 18. Temperature and humidity indicator; 19. Verification/Calibration instrument: RF and microwave power amplifier.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the RF and microwave power amplifier being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the standard medium-power meter method for calibrating the rated output power of RF and microwave power amplifiers; 1.2 Use the attenuator method for calibrating the rated output power of RF and microwave power amplifiers; 1.3 Use the directional coupler method for

measured RF and microwave power amplifier, such as switches, buttons, and knobs;

4. Be familiar with the basic operation of the measured RF and microwave power amplifier, and complete basic functional checks such as power-on preheating and self-check of the measured instrument;
5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement;
6. Connect the testing cable and adapter;
7. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the rated output power;
8. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the gain and gain flatness;
9. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the 1dB compression point output power;
10. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the maximum output power;
11. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the gain adjustment range;
12. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the harmonic distortion and clutter suppression;
13. Read the indication of the measured RF and microwave power amplifiers and standard power meters, and complete the calibration of the third-order intercept;
14. Read the indication of the measured RF and microwave power amplifiers and noise coefficient analyzers, and complete the calibration of the noise coefficient;
15. Use the vector network analyzer calibration kit to complete the network analyzer self-calibration;

calibrating the rated output power of RF and microwave power amplifiers;

1.4 Use the power meter method for calibrating the gain adjustment range of RF and microwave power amplifiers;

1.5 Use the vector network analyzer method for calibrating the gain adjustment range of RF and microwave power amplifiers;

1.6 Use RF and microwave power amplifiers for calibration measurement data processing;

1.7 Store and maintain RF and microwave power amplifiers.

2.0 Principles

The person performing this task must be able to explain the following principles:

2.1 The composition and working principle of a solid-state amplifier and traveling-wave tube amplifier;

2.2 The selecting principle of a standard instrument group.

3.0 Theories

The person performing this task must be able to explain the following:

3.1 Basic knowledge of electrical applications;

3.2 Basic knowledge of radio electronics metrology;

3.3 Precautions for using RF and microwave power amplifiers.

4.0 Essential Skills

4.1 Communication skills;

4.2 Customer service skills;

4.3 Teamwork skills;

4.4 Learning skills;

4.5 Instrument operation skills.

5.0 Math Skills

5.1 Calculation of the indication error of the measurement results;

5.2 Proper handling of other measured data.

16. Read the indication of the measured RF and microwave power amplifiers and network analyzers, and complete the calibration of the input voltage standing wave ratio; 17. Complete the measured data processing of various indicators; 18. Maintain the equipment used; 19. Clean the workplace; 20. Store the equipment used.	
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of RF and microwave power amplifiers.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of RF and microwave power amplifiers; 2. Safety operation of standard instruments; 3. Calibration specifications for RF and microwave power amplifiers; 4. Occupational health and safety; 5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF HIGH-FREQUENCY MICROWAVE NOISE	**TASK NO.**	5054
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the waveguide noise generator in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Standard waveguide noise generator; 3. Noise calibration device; 4. Vector network analyzer; 5. Vector network analyzer and waveguide calibration kit; 6. Coaxial testing cable and supporting adapter; 7. Temperature and humidity indicator; 8. Verification/Calibration instrument: waveguide noise generator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the waveguide noise generator being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured waveguide noise generator switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of the measured waveguide noise generator, and complete basic functional checks such as power-on preheating and self-check of the measured instrument; 5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 6. Connect the testing cable and adapter; 7. Read the indication of the measured waveguide noise generator and standard	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use a waveguide noise generator for the measured data processing of excess noise ratio calibration; 1.2 Use a waveguide noise generator for the measured data processing of voltage standing wave ratio calibration; 1.3 Store and maintain waveguide noise generators. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a waveguide noise generator; 2.2 The selecting principle of a standard instrument group. **3.0 Theories** The person performing this task must be able to

waveguide noise generator, and complete the calibration of excess noise ratio of the measured waveguide noise generator; 8. Use the vector network analyzer calibration kit to complete the network analyzer self-calibration; 9. Read the indication of the measured waveguide noise generator and vector network analyzer, and complete the calibration of voltage standing wave ratio of the measured waveguide noise generator; 10. Complete the measured data processing of various indicators; 11. Maintain the equipment used; 12. Clean the workplace; 13. Store the equipment used.	explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using waveguide noise generators. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of waveguide noise generators.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of waveguide noise generators; 2. Safety operation of standard instruments; 3. Calibration specifications for waveguide noise generators; 4. Occupational health and safety; 5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF PULSE PARAMETERS	**TASK NO.**	5055
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the analog oscilloscope, pulsing voltmeter, and pulse signal generator in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Oscilloscope calibrator; 3. Signal generator; 4. Universal counter; 5. Digital multimeter; 6. High sensitivity oscilloscope; 7. Sinusoidal signal generator; 8. Coaxial attenuator; 9. Standard pulse amplitude generator; 10. Pulse amplitude comparator; 11. Sampling oscilloscope; 12. Power divider; 13. Pulse signal source; 14. Coaxial testing cable and supporting adapter; 15. Temperature and humidity indicator; 16. Verification/Calibration instrument: analog oscilloscope, pulsing voltmeter, and pulse signal generator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the analog oscilloscope, pulsing voltmeter, and pulse signal generator being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured analog oscilloscope, pulsing voltmeter, and pulse signal generator	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the high sensitivity oscilloscope method for verifying the calibrated signal amplitude of analog oscilloscopes; 1.2 Use the oscilloscope calibrator method for verifying the calibrated signal amplitude of analog oscilloscopes; 1.3 Use the comparator method for verifying the pulse output amplitude of pulse signal generators; 1.4 Use the digital voltmeter method for verifying

switches, buttons, knobs, etc.;

4. Be familiar with the basic operation of the measured analog oscilloscope, pulsing voltmeter, and pulse signal generator, and complete basic functional checks such as power-on preheating and self-check of the measured instrument;
5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement;
6. Connect the testing cable and adapter;
7. Adjust the set oscilloscope calibrator, read the measured analog oscilloscope and oscilloscope calibrator indication, and complete the verification of the horizontal deflection system of the analog oscilloscope;
8. Adjust the set oscilloscope calibrator, read the measured analog oscilloscope and oscilloscope calibrator indication, and complete the verification of the vertical deflection system of the analog oscilloscope;
9. Adjust the set high sensitivity oscilloscope, read the measured analog oscilloscope and high sensitivity oscilloscope indication, and complete the verification of the calibrated signal amplitude of the analog oscilloscope;
10. Adjust the set standard pulse amplitude generator, read the measured pulsing voltmeter and standard pulse amplitude generator indication, and complete the verification of the measurement of DC voltage and pulse amplitude of the pulse voltmeter;
11. Adjust the set pulse amplitude comparator, read the measured pulse signal generator and pulse amplitude comparator indication, and complete the verification of pulse output amplitude of the pulse signal generator;
12. Adjust the set oscilloscope, read the measured pulse signal generator and oscilloscope indication, and complete the verification of pulse rising edge and waveform distortion of the pulse signal generator;
13. Adjust the set counter, read the

the pulse output amplitude of pulse signal generators;

1.5 Storage and maintenance methods for analog oscilloscopes, pulsing voltmeters, and pulse signal generators.

2.0 Principles

The person performing this task must be able to explain the following principles:

2.1 The composition and working principle of an analog oscilloscope;

2.2 The composition and working principle of a pulsing voltmeter;

2.3 The composition and working principle of a pulse signal generator;

2.4 The selecting principle of a standard instrument group.

3.0 Theories

The person performing this task must be able to explain the following:

3.1 Basic knowledge of electrical applications;

3.2 Basic knowledge of radio electronics metrology;

3.3 Precautions for using analog oscilloscopes, pulsing voltmeters, and pulse signal generators.

4.0 Essential Skills

4.1 Communication skills;

4.2 Customer service skills;

4.3 Teamwork skills;

4.4 Learning skills;

4.5 Instrument operation skills.

5.0 Math Skills

5.1 Calculation of the indication error of the measurement results;

5.2 Proper handling of other measured data.

measured pulse signal generator and counter indication, and complete the verification of pulse width and frequency of the pulse signal generator; 14. Complete the measured data processing of various indicators; 15. Maintain the equipment used; 16. Clean the workplace; 17. Store the equipment used.	
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of analog oscilloscopes, pulsing voltmeters, and pulse signal generators.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of analog oscilloscopes, pulsing voltmeters, and pulse signal generators; 2. Safety operation of standard instruments; 3. Verification regulations for analog oscilloscopes; 4. Verification regulations for pulsing voltmeters; 5. Calibration specifications for pulse signal generators; 6. Occupational health and safety; 7. Equipment maintenance procedures; 8. Knowledge of safety and environmental protection; 9. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF VIDEO PARAMETERS	**TASK NO.**	5056
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the TV signal field strength meter, and TV video signal generator in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Video signal generator; 3. TV modulator; 4. TV testing transmitter; 5. Frequency counter; 6. TV video signal analyzer; 7. Signal generator; 8. Standard attenuator; 9. Vector network analyzer and supporting calibration kit; 10. Impedance converter; 11. Oscilloscope; 12. 75Ω load; 13. Coaxial testing cable and supporting adapter; 14. Temperature and humidity indicator; 15. Verification/Calibration instrument: TV signal field strength meter and TV video signal generator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the TV signal field strength meter, and TV video signal generator being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured TV signal field strength meter and TV video signal generator switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the signal source method for verifying the carrier frequency of TV signal field strength meters; 1.2 Use the TV modulator method for verifying the carrier frequency of TV signal field strength meters; 1.3 Use the TV testing transmitter method for verifying the carrier level of TV signal field strength meters; 1.4 Use the TV modulator method for verifying the carrier level of TV signal field strength

the measured TV signal field strength meter and TV video signal generator, and complete basic functional checks such as power-on preheating and self-check of the measured instrument; 5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 6. Connect the testing cable and adapter; 7. Adjust the set signal generator and TV modulator, read the measured TV signal field strength meter and standard instrument indication, and complete the verification of carrier frequency of the TV signal field strength meter; 8. Adjust the set video signal generator and TV testing transmitter, read the measured TV signal field strength meter and standard instrument indication, and complete the verification of carrier level and range indication of the TV signal field strength meter; 9. Adjust the set signal generator and the measured TV signal field strength meter, read the measured TV signal field strength meter indication, and complete the verification of 3dB test bandwidth of the TV signal field strength meter; 10. Use the vector network analyzer calibration kit to complete the network analyzer self-calibration; 11. Read the measured TV signal field strength meter and vector network analyzer indication, and complete the calibration of input voltage standing wave ratio of the measured TV signal field strength meter; 12. Adjust the set measured TV video signal generator and video signal analyzer, read the measured TV video signal generator and video signal analyzer indication, and complete the calibration of video image signal, composite synchronizing signal, and composite blanking signal of the TV video signal generator; 13. Adjust the set measured TV video signal generator, read the frequency meter indication, and complete the calibration of drive signal of the TV video signal generator;	meters; 1.5 Store and maintain TV signal field strength meters and TV video signal generators. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a TV signal field strength meter; 2.2 The composition and working principle of a TV video signal generator; 2.3 The selecting principle of a standard instrument group. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using TV signal field strength meters and TV video signal generators. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.

14. Complete the measured data processing of various indicators; 15. Maintain the equipment used; 16. Clean the workplace; 17. Store the equipment used.	
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of TV signal field strength meters and TV video signal generators.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of TV signal field strength meters and TV video signal generators; 2. Safety operation of standard instruments; 3. Verification regulations for TV signal field strength meters; 4. Calibration specifications for TV video signal generators; 5. Occupational health and safety; 6. Equipment maintenance procedures; 7. Knowledge of safety and environmental protection; 8. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF COMMUNICATION MEASURING INSTRUMENTS	**TASK NO.**	5057
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the wireless channel simulator in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Signal generator; 3. Spectrum analyzer; 4. Power meter; 5. Frequency meter; 6. BPSK modulator; 7. Arbitrary waveform generator; 8. Oscilloscope; 9. Vector network analyzer and supporting calibration kit; 10. Rubidium atom frequency standard; 11. Coaxial testing cable and supporting adapter; 12. Temperature and humidity indicator; 13. Verification/Calibration instrument: wireless channel simulator.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the wireless channel simulator being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured wireless channel simulator switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of the measured wireless channel simulator, and complete basic functional checks such as power-on preheating and self-check of the measured instrument;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the network analyzer method for verifying the path delay of time of wireless channel simulators; 1.2 Use the waveform generator method for verifying the path delay of time of wireless channel simulators; 1.3 Use the TV testing transmitter method for verifying the carrier level of TV signal field strength meters; 1.4 Store and maintain wireless channel simulators. **2.0 Principles**

5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 6. Connect the testing cable and adapter; 7. Adjust the set signal generator and wireless channel simulator, read the frequency meter indication, and complete the calibration of local oscillator output frequency and frequency range of the wireless channel simulator; 8. Adjust the set signal generator, and the measured wireless channel simulator and spectrum analyzer, read the spectrum analyzer indication, and complete the calibration of path loss, output attenuation, Doppler maximum frequency shift, and spectral purity of the wireless channel simulator; 9. Adjust the set signal generator, and the measured wireless channel simulator and power meter, read the power meter indication, and complete the calibration of output level of the wireless channel simulator; 10. Use the vector network analyzer calibration kit to complete the network analyzer self-calibration; 11. Read the measured wireless channel simulator and vector network analyzer indication, and complete the calibration of path delay, initial delay, gain flatness, RF I/O port voltage standing wave ratio of the measured wireless channel simulator; 12. Complete the measured data processing of various indicators; 13. Maintain the equipment used; 14. Clean the workplace; 15. Store the equipment used.	The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a wireless channel simulator; 2.2 The selecting principle of a standard instrument group. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using wireless channel simulators. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of wireless channel simulators.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of wireless channel simulators; 2. Safety operation of standard instruments; 3. Calibration specifications for wireless channel simulators; 4. Occupational health and safety;

	5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF TRANSISTORS AND INTEGRATED CIRCUIT MEASURING INSTRUMENTS	**TASK NO.**	5058
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the universal digital integrated circuit test system in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. Standard voltage source; 3. Digital multimeter; 4. Frequency meter; 5. Standard resistor group; 6. Standard sample group; 7. Digital oscilloscope; 8. Verification adapter plate; 9. Temperature and humidity indicator; 10. Verification/Calibration instrument: universal digital integrated circuit test system.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the universal digital integrated circuit test system being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured universal digital integrated circuit test system switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of the measured universal digital integrated circuit test system, and correctly complete basic functional checks such as power-on preheating and self-check of the measured instrument;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Operate the universal digital integrated circuit test system; 1.2 Store and maintain the universal digital integrated circuit test system. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of a universal digital integrated circuit test system; 2.2 The selecting principle of a standard instrument group. **3.0 Theories**

5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement; 6. Connect the testing cable and adapter; 7. Adjust the set standard resistor, and the measured universal digital integrated circuit test system, read the digital multimeter and universal digital integrated circuit test system indication, and complete the verification of device power supply setting voltage parameters, device power supply setting current parameters, precision measurement unit adding voltage measurement current parameters, precision measurement unit adding current measurement voltage parameters, and driving unit voltage setting parameters of the universal digital integrated circuit test system; 8. Adjust the set standard DC voltage source, and the measured universal digital integrated circuit test system, read the universal digital integrated circuit test system indication, and complete the verification of device comparison unit voltage measurement parameters of the universal digital integrated circuit test system; 9. Adjust the set digital oscilloscope, and the measured universal digital integrated circuit test system, read the digital oscilloscope and universal digital integrated circuit test system indication, and complete the verification of device drive signal rise/fall time parameters, and deviation between drive signal channels of the universal digital integrated circuit test system; 10. Adjust the set frequency meter, and the measured universal digital integrated circuit test system, read the frequency meter and universal digital integrated circuit test system indication, and complete the verification of accuracy of device system clock frequency setting of the universal digital integrated circuit test system; 11. Complete the measured data processing of various indicators; 12. Maintain the equipment used; 13. Clean the workplace; 14. Store the equipment used.	The person performing this task must be able to explain the following: 3.1 Basic knowledge of electrical applications; 3.2 Basic knowledge of radio electronics metrology; 3.3 Precautions for using universal digital integrated circuit test systems. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Learning skills; 4.5 Instrument operation skills. **5.0 Math Skills** 5.1 Calculation of the indication error of the measurement results; 5.2 Proper handling of other measured data.

DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of universal digital integrated circuit test systems.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of universal digital integrated circuit test systems; 2. Safety operation of standard instruments; 3. Verification regulations for universal digital integrated circuit test systems; 4. Occupational health and safety; 5. Equipment maintenance procedures; 6. Knowledge of safety and environmental protection; 7. Knowledge of safe use of electricity.

OCCUPATION	METROLOGY TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	RADIO MEASUREMENT	**DUTY NO.**	505
TASK TITLE	MEASUREMENT OF CARDIAC AND EEG MEDICAL TESTERS	**TASK NO.**	5059
PERFORMANCE CRITERIA	The person performing this task must be able to calibrate the ECG/EEG tester and ECG monitor and tester in accordance with technical requirements, and report the calibration results.		
RANGE STATEMENT	The task can be performed in the laboratory under the supervision of a Senior Technician or a Metrology Engineer. The tools and equipment to be used include: 1. Protective equipment such as antistatic bracelets and gloves; 2. DC digital voltmeter; 3. AC digital voltmeter; 4. Universal counter; 5. Ohmmeter; 6. ULF peak voltmeter; 7. Distortion analyzer; 8. Sine wave low-frequency signal source; 9. Digital oscilloscope; 10. Distortion analyzer; 11. Temperature and humidity indicator; 12. Verification/Calibration instrument: ECG/EEG tester and ECG monitor and tester.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear protective equipment such as antistatic bracelets and gloves; 2. Refer to the technical instruction of the ECG/EEG tester, and ECG monitor and tester being tested, and select a standard instrument group with the appropriate accuracy level based on the technical index or usage requirements of the technical instruction; 3. Check the basic appearance of the measured ECG/EEG tester, and ECG monitor and tester switches, buttons, knobs, etc.; 4. Be familiar with the basic operation of the measured ECG/EEG tester, and ECG monitor and tester, and correctly complete basic functional checks such as	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Store and maintain the ECG/EEG tester; 1.2 Store and maintain the ECG monitor and tester. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The composition and working principle of the ECG/EEG tester; 2.2 The composition and working principle of the ECG monitor and tester; 2.3 The selecting principle of a standard instrument group.

power-on preheating and self-check of the measured instrument;

5. Read the temperature and humidity indicator, and record the temperature and humidity during on-site measurement;
6. Connect the testing cable and adapter;
7. Adjust the set ohmmeter, and the measured ECG/EEG tester, read the ohmmeter indication, and complete the verification of simulate normal skin impedance examination of the ECG/EEG tester;
8. Adjust the set measured ECG/EEG tester, and ECG monitor and tester, read the DC digital voltmeter indication, and complete the verification of relative error of standard square wave amplitude of the ECG/EEG tester, and ECG monitor and tester;
9. Adjust the set measured ECG/EEG tester, and ECG monitor and tester, read the universal counter indication, and complete the verification of relative error of standard square wave period and sine wave frequency of the ECG/EEG tester, and ECG monitor and tester;
10. Correctly adjust the set measured ECG/EEG tester, and ECG monitor and tester, read the LF peak voltmeter indication, and complete the verification of relative error of sine wave amplitude of the ECG/EEG tester, and ECG monitor and tester;
11. Adjust the set measured ECG/EEG tester or ECG monitor and tester, and distortion meter, read the distortion meter indication, and complete the verification of relative error of polarization voltage of the ECG/EEG tester, and ECG monitor and tester;
12. Adjust the set measured ECG monitor and tester, read the universal counter indication, and complete the verification of heart rate relative error of standard heart rate signal of the ECG monitor and tester;
13. Adjust the set measured ECG monitor and tester, and digital oscilloscope, read the digital oscilloscope indication, and complete the verification of standard heart rate signal sharp wave width of the

3.0 Theories

The person performing this task must be able to explain the following:

3.1 Basic knowledge of electrical applications;

3.2 Basic knowledge of radio electronics metrology;

3.3 Precautions for using the ECG/EEG tester;

3.4 Precautions for using the ECG monitor and tester.

4.0 Essential Skills

4.1 Communication skills;

4.2 Customer service skills;

4.3 Teamwork skills;

4.4 Learning skills;

4.5 Instrument operation skills.

5.0 Math Skills

5.1 Calculation of the indication error of the measurement results;

5.2 Proper handling of other measured data.

ECG monitor and tester; 14. Adjust the set measured ECG monitor and tester, read the LF peak voltmeter indication, and complete the verification of amplitude relative error of standard heart rate signal of the ECG monitor and tester; 15. Adjust the set ohmmeter, and the measured ECG monitor and tester, read the ohmmeter indication, and complete the verification of relative error of input circuit current sampling resistance of the ECG monitor and tester; 16. Complete the measured data processing of various indicators; 17. Maintain the equipment used; 18. Clean the workplace; 19. Store the equipment used.	
DESCRIPTION OF THE END PRODUCT / SERVICE	Calibration is implemented in accordance with technical specifications to form the measurement results of the ECG/EEG tester, and ECG monitor and tester.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Maintenance of the ECG/EEG tester, and ECG monitor and tester. 2. Safety operation of standard instruments; 3. Verification regulations for the ECG/EEG tester; 4. Verification regulations for the ECG monitor and tester; 5. Occupational health and safety; 6. Equipment maintenance procedures; 7. Knowledge of safety and environmental protection; 8. Knowledge of safe use of electricity.

TABLE 1: DACUM CHARTS FOR METROLOGY TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Measurement of geometric quantities	1.1 Calibration of work linear scale. 1.2 Gauge block calibration. 1.3 Calibration of conventional angle measuring instruments. 1.4 Calibration of shape measuring instruments. 1.5 Calibration of vernier species measuring tools. 1.6 Calibration of differential type measuring tools. 1.7 Calibration of indicator type measuring tools. 1.8 Calibration of angle measuring tools.	**General skills and knowledge** · Use of measuring instruments and tools · Measurement principles and methods · Drawing reading and understanding · Geometric measurement error analysis · Data processing and report writing · Calibration and traceability · Communication and teamwork · Safety awareness and quality control **Tools and equipment** · Temperature and humidity indicator, standard steel tape, standard metal linear scale, reading microscope, feeler gauge, length measuring instrument or length measuring machine, and steel tape · Gauge block, contact interferometer or gauge block comparator, optical meter, and flat crystal · Regular polygonal prism, level calibrator, small angle inspection instrument, autocollimator, knife straightedge, and mandrel · Milling straight edges, knife straightedge, electronic level gauge, surface roughness comparison specimen, planar equal thickness interferometer, standard cylinder, standard ellipsometer set, and standard ring gauge · Dynamometer · Indicator tester · Square measuring instrument **Materials** · Personal protective equipment, such as safety shoes, and gloves · Measurement lubricant · Cleaner **Requirements for employees** · Technical knowledge and skills · Accuracy and meticulousness · Problem solving ability, teamwork

DUTIES	TASKS	ENABLERS
		awareness, and communication skills · Safety consciousness
2.0 Mechanical measurement	2.1 Calibration of mass instruments. 2.2 Measurement of weighing instruments. 2.3 Measurement of small capacity instruments. 2.4 Measurement of force value instruments. 2.5 Measurement of metal hardness testers. 2.6 Measurement of non-metal hardness testers. 2.7 Measurement of pressure measuring instruments.	**General skills and knowledge** · Principles and theoretical knowledge of mechanical measurement · Use of measuring instruments and equipment · Measured data processing and analysis · Quality control and standard system · Safety and environmental awareness **Tools and equipment** · Standard weight, mass comparator, standard balance, and temperature and humidity indicator · Second-class standard volumetric glass, and electronic stopwatch · Density measuring equipment, standard measuring instrument set, weighing device, precision thermometer, and reading glass · Force measuring weight, force standard machine, standard dynamometer, coaxiality tester, sound level meter, dial indicator, dial gauge, extensometer designator, insulation resistance measuring instrument, and coaxiality specimen · Brinell hardness tester, Rockwell hardness tester, Vickers hardness tester, projector, tool microscope, sounding installation tester, vertical optical meter, level gauge, feeler gauge, right angle ruler, check bar, standard scale, and vernier caliper · Digital pressure gauge, piston pressure gauge, precision pressure gauge, pressure pump, T-pipe, DC stabilized voltage and current power supply, insulation resistance meter, voltage withstanding tester, and steel tape **Materials** · Personal protective equipment, such as safety shoes, and gloves · Measuring liquids and media

DUTIES	TASKS	ENABLERS
		· Calibration air and pressure sources · Connecting pipe fittings and accessories · Maintenance and cleaning supplies **Requirements for employees** · Technical knowledge and skills · Accuracy and meticulousness · Problem solving ability, teamwork awareness, and communication skills · Safety consciousness
3.0 Temperature measurement	3.1 Calibration of thermocouple. 3.2 Calibration of glass thermometers. 3.3 Calibration of pressure type thermometers. 3.4 Calibration of industrial platinum and copper thermistors. 3.5 Calibration of medical electronic thermometers.	**General skills and knowledge** · Principles and theoretical knowledge of temperature measurement · Use of thermometric instruments · Data record and analysis · Environmental impact factor · Security and risk management · Laws and standards **Tools and equipment** · Standard thermocouple, thermoelectromotive force measuring instrument, verification furnace, annealing furnace, electrical annealing device, freezing point thermostat, outside micrometer, metal ruler, standard mercury thermometer, second-class standard platinum resistance thermometer, DC potentiometer, and reading telescope · Constant temperature bath, supporting electrical testing equipment, and temperature and humidity indicator · Second-class standard mercury thermometer, insulation resistance meter, change-over switch, high temperature furnace, triple point of water cell and its insulation container, and liquid nitrogen Dewar flask or liquid nitrogen comparator · Standard thermometer, and ice-making and deicing device **Materials** · Personal protective equipment, such

DUTIES	TASKS	ENABLERS
		as safety shoes, and gloves; · Measured medium · Calibration air and pressure sources · Connecting pipe fittings and accessories · Maintenance and cleaning supplies **Requirements for employees** · Technical knowledge and skills · Accuracy and meticulousness · Problem solving ability, teamwork awareness, and communication skills · Safety consciousness
4.0 Electromagnetic measurement	4.1 Measurement of DC resistors. 4.2 Measurement of DC low resistance meters. 4.3 Measurement of DC potentiometers. 4.4 Measurement of DC resistance voltage dividers. 4.5 Measurement of multi-function digital instruments. 4.6 Measurement of resistance strain gauges. 4.7 Measurement of AC parameter instruments. 4.8 Measurement of electric energy meters. 4.9 Measurement of AC charging piles for electric vehicles.	**General skills and knowledge** · Principles and theoretical knowledge of electromagnetic measurement · Use of electric measuring instruments · Electromagnetic calibration and standardization · Electromagnetic compatibility (EMC) · Electromagnetic signal processing and analysis · Electromagnetic security and risk management **Tools and equipment** · Resistor calibration device, insulation resistance meter, oil slot, thermometer, low thermal potential testing line, temperature and humidity indicator, and standard resistor · Voltage tester, standard potentiometer, insulation resistance tester, and low thermal potential testing line · Standard DC voltage generator, multi-function standard source, multimeter, and low thermal potential testing line · Charging pile calibration device, electronic load, and reference clock (electronic stopwatch) **Materials** · Personal protective equipment, such

DUTIES	TASKS	ENABLERS
		as safety shoes, and gloves · Measuring cables and probes · Coupling agents · Insulation and shielding materials · Maintenance and cleaning supplies **Requirements for employees** · Technical knowledge and skills · Accuracy and meticulousness · Problem solving ability, teamwork awareness, and communication skills · Safety consciousness
5.0 Radio measurement	5.1 Measurement of high-frequency voltage. 5.2 Measurement of pulse power meters. 5.3 Measurement of RF and microwave power amplifiers. 5.4 Measurement of high-frequency microwave noise. 5.5 Measurement of pulse parameters. 5.6 Measurement of video parameters. 5.7 Measurement of communication measuring instruments. 5.8 Measurement of transistors and integrated circuit measuring instruments.	**General skills and knowledge** · Electromagnetic wave and RF knowledge · RF measurement equipment and measurement technique · Antennas and wireless communication systems · RF signal processing and analysis · RF security and risk management **Tools and equipment** · AC standard voltage source, HF standard voltage source, LF standard voltmeter, signal generator, and temperature and humidity indicator · Pulse signal generator, vector network analyzer and supporting calibration kit, step attenuator, digital voltmeter, power divider, isolator, and coaxial testing cable and supporting adapter · Standard power meter, spectrum

DUTIES	TASKS	ENABLERS
	5.9 Measurement of cardiac and EEG medical testers.	analyzer, and noise coefficient analyzer · Standard waveguide noise generator, and noise calibration device · Oscilloscope calibrator, digital multimeter, and high sensitivity oscilloscope · Video signal generator, TV modulator, TV testing transmitter, frequency counter, TV video signal analyzer, and impedance converter · BPSK modulator, arbitrary waveform generator, and rubidium atom frequency standard · ULF peak voltmeter, and distortion analyzer **Materials** · Personal protective equipment, such as safety shoes, and gloves · Protective equipment such as antistatic bracelets and gloves · Adapter and testing cable · Related load · Insulation and shielding materials · Maintenance and cleaning supplies **Requirements for employees** · Technical knowledge and skills · Accuracy and meticulousness · Problem solving ability, teamwork awareness, and communication skills · Safety consciousness