SUPPLY, DELIVERY, TESTING AND CALIBRATION AND COMMISSIONING OF 1 OFF CORE LOSS TESTER, 1 OFF COMMUTATOR PROFILER, 1 OFF AC HIPOT TESTER AND 1 OFF A VERY LOW FREQUENCY TESTER (VLF) TESTER FOR ROTATING MACHINES BUSINESS.

ROTATING MACHINES DEPOT, 150 EEL ROAD, UMBILO INDUSTRIAL, UMBILO.

REFERENCE No: OPS_RM_DBN_ SPEC_044

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DOCUMENT AUTHORITIES

Departments	Facilities and Infrastructure
Department Affected	Rotating Machines Business
Effective Date	April 2025
Compiled by	Zolani Mngqithi
Designation	Engineering Technician
Signature& Date	29.04.2025
Reviewed by	Soojith Ramnund
Designation	Engineering Manager
Signature& Date	S Ramnund 29/04/2025
Approved by	Mhlonipheni Nxumalo
Designation	Executive Manager
Signature & Date	PP

1. INTRODUCTION

This specification is for the:

#	TASK	REQUIRED
1	Design	
2	Manufacture	
3	Assess	
4	Structural Drawings	
5	Supply	✓
6	Delivery	✓
7	Documentation	✓
8	Testing	✓
9	Calibration	✓
10	Training	✓
11	Commissioning	✓

Of the specified:

#	ITEM	REQUIRED
1	Supply, delivery, testing and calibration and commissioning of 1 off core loss tester, 1 off commutator profiler, 1 off AC Hipot Tester and 1 off very low frequency tester (VLF) tester for Rotating Machines Business**.**	✓
2	Submission of project completion documents.	✓

2. SITE INSPECTION

2.1 All prospective contractors shall be required to undertake a compulsory site inspection to fully acquaint themselves with all aspects involved.

2.2 Arrangements to visit the site and confirmation of the date and time of the site inspection shall be made with Transnet Engineering Contract Manager.

2.3 The site inspection certificate shall be completed and countersigned by the contract Manager on the day of the visit and must be submitted with the tender documents.

3. INFORMATION REQUIRED

3.1 Offers will not be considered unless full particulars and sufficient literature are provided at the tendering stage to enable Transnet Engineering Technical Officers the opportunity to assess each technical offer properly.

3.2 Prospective Contractors will complete the relevant questionnaire in full and must indicate whether their offer complies with each item of the specification

3.3 Should there be insufficient space for furnishing full details; contractors shall provide the additional details in their covering letter. The additional details shall be numbered in accordance with the applicable clause specified in the specification.

3.4 As prospective contractors are considered to be experts in their field, they are obliged to identify any shortcomings, such as omissions or sub-standard requirements, to the completeness of this specification. These must be brought to the attention of Transnet Engineering at tender stage with alternatives to address these shortcomings. However, each offer shall be quoted for separately.

4. TECHNICAL REQUIREMENTS

The following regulation and codes must be complied with:-

- **The Occupational Health and Safety Act – Act 85 of 1993.**
- **SANS 17025 : 2005 General requirements for the competence of testing and calibration laboratories**

4.1 Except where otherwise provided for in the specification, all equipment offered will comply with the requirements of the relevant standard specifications of the SABS, if published, otherwise with the relevant standard of the British Standards Institution in force at the time of tendering.

4.2 Where equipment offered complies with the recognized standards of the country of manufacture and not specifically with the standards required by this specification, such equipment will be considered at the discretion of Management. In this case, tenders shall state fully all respects in which the equipment departs from the standard laid down in this specification.

4.3 The successful tender will at the conclusion of the installation provide a document along the lines "that the installation complies with national/international requirements and that all selected /designed items are compliant with Act 85 of 1995 and SABS practices applicable to the installation. The equipment has been commissioned/ calibrated and employees as specified have been trained and found competent to operate the plant."

5. SPECIFIC REQUIREMENTS

Any person with the intention of tendering shall ensure that the information below is complied with.

5.1 Operating Environment

- Indoors – workshop environment.

5.2 Scope of work

Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.1.1	Supply new measuring instruments

Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.2	Supply, test and calibrate the core loss test set.
5.2.2.1	Approx. Maximum Test capability: 40KVA
5.2.2.2	**Input:**Voltage:460VAC Current 60Amps, Frequency: Single phase, KVA: 1750HP / 40KVA

Item no.	Requirements This specification covers the minimum requirements.
5.2.2.3	Standard Features 1. Latest software 2. Zero downtime meter exchange program 3. Flux Measurement cables 4. Automated test process 5. Test reports 6. Be mobile with lockable wheels 7. Thermal overload protection 8. Certified calibration process 9. Armature testing kit 10. Pass Fail core test values specific to each frame 11. Printable and save test reports 12. Fully automated, high current, low voltage
5.2.2.4	A suitable printer must be supplied for the printing of the test reports
Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.2.5	• The meter calibration to be done through the computer.
5.2.2.6	• The test set to have operating software, interfacing with the Programmable Logic Controller (PLC) that in turn guides the test set through its test functions. • The PLC to come with a licence, if it (licence) is required.
5.2.2.7	The operation of the test set to be convenient and easy, shall only require as connecting up the test leads, typing in the parameters of the test and pushing a button, and the test set to take over from there. The operation shall be user friendly and not be labour intensive.
5.2.2.8	The core loss test set to come complete with instrumentation, output and voltmeter cables, computer (used for complete control, metering, data storage and evaluation of test results)
5.2.2.9	• These units have very low distortion, independent of load and output setting. • Ensures test results to be accurate and repeatable.
5.2.2.10	Continuously variable low voltage, high current power supply for testing stators, rotors, and armature cores.
5.2.2.11	Separate voltmeter leads for greater metering accuracy
5.2.2.12	• Output cables for stator testing. • Cable/Clamp Assembly for Armature/Rotor Testing • Input Power: 1/0 ga • Output Power: 500 MCM 30’ (9 m) • Metering Lead: 30’ (9 m)
5.2.2.13	Output is controlled by a motorized voltage regulator with variable rate of rise
5.2.2.14	Thermal overload protection
5.2.2.15	Multi-range digital meters
5.2.2.16	Emergency Off pushbutton
5.2.2.17	Fused power control circuits
5.2.2.18	True sine wave output ensures accurate and repeatable test results
5.2.2.19	Fully automated with data acquisition
5.2.1.20	On handover, the following documents shall be supplied: • User manuals in 1 set of hard copies and 1 set of PDF files in the USB . • Testing and measurement manual. • Standard operating procedure.
5.2.1.20	**Calibration certificates**

	• Each measuring instrument shall be tested and calibrated. Valid calibration certificates shall be submitted to the Project Manager. The period from date of calibration and date of submission of calibration certificates shall not be greater / older than 1 month.
5.2.1.21	All measuring instruments shall be supplied with probes, attachments, accessories, etc. necessary to support easy and convenient testing and measurements.
5.2.1.22	The supplier to provide training for 6 Transnet Engineering staff members on how to use the core loss test set, validation and storage to ensure good safe keeping.

Item no.	Requirements This specification covers the minimum requirements.
5.2.3	Supply 1 off portable, high-speed commutator profiler
5.2.3.1	• The commutator profiler shall not be affected by speed, temperature, voltage, current, surface and airborne contamination. • It shall measure the static profile (profile obtained with a contact-based measurement) • It shall measure the dynamic profile for abnormal conditions (poor commutation, poor commutator life, excessive commutator maintenance, and poor brush life) even when the static profile is acceptable • It shall be able to achieve a non-contact profiling. • It shall sense the commutator's geometry and to extract critical measurement information from each individual commutator segment as well as the commutator as a whole, while the motor or generator is running at full speed. • It shall sample the commutator surface at a frequency of up to 1 MHz, obtain commutator profiles at surface speeds greater than 1,500" per second. • It shall automatically determine the proper sampling frequency without prior knowledge of motor speed or commutator diameter.
5.2.3.2	Measurement Speed: 1M reading / second, continuous to PC memory
5.2.3.3	Dimensions: 12" x 9.5" x 1.75" [305mm x 241mm x 45mm], approximately.
5.2.3.4	Weight: 8.8 lbs [4kg], approximately.
5.2.3.5	Power Input: 85-265VAC, 50/60 Hz
5.2.3.6	Power: 5W
5.2.3.7	Operating Temperature: +32˚F – +158˚F [0˚C – +70˚C]
5.2.3.8	Vibration: MIL Standard 810E, Category 1 & 10
5.2.3.9	PC Interface: requires USB 2.0
	Measurement specifications
5.2.3.10	Linear Measuring Range (F.S.): 0.020 in [0.5mm]
5.2.3.11	Max Surface Speed: 2,000 in/sec [50.8m/s]
5.2.3.12	Probe Withstand Voltage: (not including air gap) 1,000 Volts peak
5.2.3.13	The commutator profiler shall come with the following items: • measurement module with integrated carrying case for portable operation

	• 3 meter cable/probe assembly • magnetic-mount probe holder • USB cable • Software and licence (if software requires licence) • PC with Operating System (Windows XP and 7, or latest operating system), processor Speed: >700MHz and RAM: > 512Mb
5.2.1.20	On handover, the following documents shall be supplied: • User manuals in 1 set of hard copies and 1 set of PDF files in the USB . • Testing and measurement manual. • Standard operating procedure.
5.2.1.20	**Calibration certificates** • Each measuring instrument shall be tested and calibrated. Valid calibration certificates shall be submitted to the Project Manager. The period from date of calibration and date of submission of calibration certificates shall not be greater / older than 1 month.
Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.1.21	All measuring instruments shall be supplied with probes, attachments, accessories, etc. necessary to support easy and convenient testing and measurements.
5.2.1.22	The supplier to provide training for 6 Transnet Engineering staff members on how to use the , high-speed commutator profiler, validation and storage to ensure good safe keeping.

Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.4	Design, supply, delivery, testing and calibration of a Very Low Frequency Tester used to test rotating machines equipment.
5.2.4.1	The machine must be compact and portable
5.2.4.2	Must perform DC and VLF testing
5.2.4.3	The instrument must have two independent earthing devices (electronic and mechanical discharging) and an integrated feedback protection system
5.2.4.4	Must have watertight and very rugged case with a protection class of IP67 makes additional transport boxes.
5.2.4.5	Input Voltage: 100-240 V, 50/60 Hz, 1200 VA
5.2.4.6	**Output Voltage** VLF Sine Wave : 0-34 kV peak, 24 kV rms DC : DC ± 0-34 kV VLF Square Wave: 0-34 kV Accuracy : 1%
5.2.4.7	Resistance range : 0.1 MΩ-5 GΩ
5.2.4.8	Output frequency : 0.01-0.1 Hz in steps of 0.01 Hz
5.2.4.9	Trip Current : 0.1 to 5.0 mA
5.2.4.10	Safety : 12 kV/50 Hz Feedback Protection | integrated electronic and mechanical discharge devices - Dual Discharge Device (internal)
5.2.4.11	Memory : 50 Test Record Stored, USB almost unlimited
5.2.4.12	Metering : Voltage and Current (True rms and/or peak), Capacitance, Resistance, Time, Flashover Voltage
5.2.4.13	Duty Cycle : Continuous, no thermal limitation for operating time.

5.2.4.14	HV Cable : 5 m with clamps
5.2.4.15	Computer Interface : Bluetooth and USB flash drive
5.2.4.16	On handover, the following documents shall be supplied: • User manuals in 1 set of hard copies and 1 set of PDF files in the USB . • Testing and measurement manual. • Standard operating procedure.
5.2.4.17	**Calibration certificates** • Each measuring instrument shall be tested and calibrated. Valid calibration certificates shall be submitted to the Project Manager. The period from date of calibration and date of submission of calibration certificates shall not be greater / older than 1 month.
5.2.4.18	All measuring instruments shall be supplied with probes, attachments, accessories, etc. necessary to support easy and convenient testing and measurements.
5.2.4.19	The supplier to provide training for 6 Transnet Engineering staff members on how to use the Very Low Frequency Tester, validation and storage to ensure good safe keeping.

Item no.	**Requirements** **This specification covers the minimum requirements.**
5.2.5	Supply 1 off portable, AC Hipot Test Machine
5.2.5.1	• The AC Hipot Test Machine must have the following features • Input Voltage – 220V/380V, 50 Hz • Voltage output- 0-30Kv AC, (Peak) 0-21.2Kv (RMS) • Output Frequency – 0-50hz • Trip current – 2mA – 5A • Predefined standard-compliant cable test sequences • Symmetrical sine wave at high voltage • RMS measurement of output voltage and current • Measurement of capacitive and resistive load • Automatic load dependent frequency selection • Display of current test time • Integrated real-time scope function • Automatic measurement reporting • Report storage via USB or RS232 • PC software for data analysis and storage • Flashover detection and ultra fast switch off • Flashover voltage measurement • Time optimized burning mode • Flashing lights • Automatic discharge
5.2.5.2	On handover, the following documents shall be supplied: • User manuals in 1 set of hard copies and 1 set of PDF files in the USB . • Testing and measurement manual. • Standard operating procedure.
5.2.5.3	**Calibration certificates** • Each measuring instrument shall be tested and calibrated. Valid calibration certificates

	shall be submitted to the Project Manager. • The period from date of calibration and date of submission of calibration certificates shall not be greater / older than 1 month.
5.2.5.4	• All measuring instruments shall be supplied with probes, attachments, accessories, etc. necessary to support easy and convenient testing and measurements.
5.2.5.5	• The supplier to provide training for 6 Transnet Engineering staff members on how to use the AC Hipot Test Machine, validation and storage to ensure good safe keeping.

5.3 Supply and delivery

- The equipment shall be supplied and delivered at Transnet Engineering, 311 Solomon Mahlangu Drive.

5.4 Calibration

- The measuring instruments shall come with valid calibration certificates.
- No equipment will be accepted by TE without the satisfaction of the conditions above.

5.5 Testing

- All tests to be done on site.
- Additional tests can be ordered by Transnet Engineering.

5.6 Completion / handover

- A testing period of 1 month (744 hours for 24/7 shifts and 248 hours for 8 hour shifts).
- No equipment will be accepted by TE without the satisfaction of the conditions above.

5.7 Warranty

- The warranty period shall be 12 months.
- The contractor shall undertake to repair all faults due to bad workmanship and/or faulty materials during a period of 12 months, calculated from the date that the completed plant installation is accepted by TE.
- Any latent defects that become apparent during the warranty period shall be rectified to the satisfaction of TE at the cost of the supplier.
- The supplier shall agree to replace at his/her cost any defective items discovered within the guaranteed period.

Note: All work to be completed in each respect by suitably qualified person.

6. OTHER INFORMATION RELATED TO THE SCOPE

6.1 This specification states the minimum requirements relating to the work and in no way absolves the contractor from responsibility for sound engineering practice. Any omissions or sub-standard requirements of this specification must be brought to the attention of Transnet Engineering at tender stage and optional prices for addressing such omissions must be provided.

6.2 Any matter relating to this work, which requires a decision from Transnet Engineering shall be presented to the Project Manager in charge.

6.3 All offers shall be completed in every respect with this specification. Only completed tenders shall be considered

6.4 The Technical Officer reserves the right to have the proposal checked independently by a third party.

6.5 Tenders must allow for monthly progress and clarification meetings on site initially and after commissioning for defect meetings when required. A meeting will be held after issuing of the tender to establish the exact scope and magnitude of the contract. No tender will be considered unless it has this Certificate signed by the Engineer or his representative.

7. HEALTH AND SAFETY REQUIREMENTS

7.1 All equipment whether detailed in this specification or not shall comply with the requirements of the Occupational Health and Safety Act 85 of 1993 as amended and all other applicable legislation including specific set of regulations and local authority bylaws where applicable.

7.2 All the necessary safety equipment such as guards over rotating equipment shall be supplied and the equipment shall comply fully with all the requirements of the South African Occupational Health and Safety Act, Act 85 of 1993 and all other applicable legislation including specific set of regulations and local authority bylaws where applicable.

8. SPECIALIST SUB-CONTRACTORS

8.1 Only specialist sub-contractors who have previously successfully completed work of the type and extent specified in this document should be engaged.
The tenderer shall provide the technical officer with sufficient proof of having suitable experience regarding the design and manufacturing of similar equipment. To this end, complete and detailed reference list shall be submitted with the tender. Reference list shall include addresses as well as contact person who may be visited for inspection of the equipment during the adjudication period.

8.2 The tender shall submit a complete list of proposed sub-contractors and suppliers of major components with his tender.

8.3 The tenderer shall be prepared to commit themselves in writing to the technical officer with an adequate, experienced and stable project team for the duration of the contract.

8.4 Transnet Engineering will not consider any Tenderer's offer that, in the sole opinion of Transnet Engineering, does not have adequate experience in the design and manufacture of such equipment.

8.5 Contractors shall do the installation simultaneously with other contractors on-site busy with other work and shall plan work that it integrates with other work performed.

9. EQUIPMENT

9.1 The required items shall be complete in all respects.

9.2 Tenderers shall supply a list of all materials proposed as well as the addresses of the local support companies.

10. GENERAL REQUIREMENTS

Operation will be in the following conditions:

Altitude	Sea level
Ambient temperature	0˚C to 45˚C

Relative humidity	50% to 100%
Atmosphere	Heavy saline

11. DEFINITIONS AND ABBERVIATIONS

CLIENT Transnet Engineering Durban

TECHNICAL OFFICER: Project Manager, Transnet Engineering Durban
CONTRACTOR Contractor appointed under this specification document

12. GENERAL

12.1 The successful tenderer will be subjected to a workshop inspection by Transnet Engineering, to ensure that the facilities are to the satisfaction of the Transnet Engineering in terms of the quality control and equipment capabilities for manufacturing such type of equipment.

12.2 The tenderers shall guarantee that the rating and size etc. of the equipment offered, will be adequate to perform the duties required.

13. PENALTY CLAUSES

13.1 Due to the criticality of this project, penalties will be levied for late deliveries.