DESIGN, SUPPLY, DELIVERY, TESTING, CALIBRATION AND COMMISSIONING A 15 kV HIGH VOLTAGE TESTER WITH 30 kV POWER PACK

FOR ROTATING MACHINES BUSINESS, TRANSNET ENGINEERING DURBAN

Rotating Machines Depot 150 Eel Road, Umbilo, Durban

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CHANGES MADE FROM REVISION 04

No	Ref	Comment
1	2	Atmosphere: Changed to “Indoor workshop environment”
2	4.3	Insert Pass/Fail criteria inserted into table
3	4.3.1	continuous “is added to describe the voltage
4	4.3.4	“High performance “is removed cannot be measured
5	4.3.6	Changed to “Operating Platform must be Android or equivalent”
6	4.3.9	“To be checked and verified on SAT” added
7	4.3.12	“A suitable selector switch” replaces “Automatic switching”
8	7.2	Changed to “The supplier shall provide delivery, off-loading, positioning in the Armature workshop test area, connection to existing 220V plug point with earth connection “The printer will be placed on trolley adjacent to the high voltage tester.
9	9.6	Changed to “SAT report according to 4.2 conducted at TE workshop with the Client”
10	10.3	Changed to “Defective items shall be repaired or replaced within the agreed turnaround period of one month”
11	10.5	Changed to “The offer shall identify the support contact, response process, expected turnaround times of one month and any exclusions”
12	Annexure A: 14	Changed from 7.2 to 7.1
13	Annexure A: 16-18	Changed from 7.4 to 7.2

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1. PURPOSE AND SCOPE

This specification defines the minimum requirements for the design, supply, delivery, off-loading, testing, calibration, training, commissioning and handover of one complete high voltage tester system for the Rotating Machines Depot in Durban.

The system will be used for testing traction and auxiliary stator coils, traction motors, windings and traction armatures. The supply shall be complete, fully compatible and ready for safe operation. Any item necessary for compliance or operation, whether expressly listed or reasonably implied, shall be included and identified in the pricing schedule.

Business need: The equipment is required to improve the efficiency, repeatability and reliability of traction motor, armature and winding testing, and to strengthen fault detection and quality assurance during production restoration activities.

1.1 Scope summary

Activity	Required
Design / configuration	Yes
Supply and delivery	Yes
Off-loading and connection	Yes
Site acceptance testing	Yes
Calibration	Yes
Training for at least six employees	Yes
Commissioning and handover	Yes
Documentation and warranty	Yes

2. SITE AND OPERATING CONDITIONS

Parameter	Requirement
Location	Rotating Machines Depot, 150 Eel Road, Umbilo, Durban
Altitude	Approximately sea level
Ambient temperature	0 degrees C to 45 degrees C
Relative humidity	50% to 100%
Atmosphere	Indoor workshop environment
Electrical supply	220-240 V AC, 50 Hz, single-phase, earthed supply

3. APPLICABLE LEGISLATION AND STANDARDS

- Occupational Health and Safety Act 85 of 1993 and applicable regulations.
- ISO/IEC 17025:2017, as adopted in South Africa as SANS/ISO IEC 17025, for calibration competence and traceability. The calibration laboratory accreditation scope must cover the relevant measurements, or equivalent traceability acceptable to Transnet shall be demonstrated.
- IEEE 522-2023 or the latest applicable edition accepted by Transnet, for impulse/surge testing of machine windings.
- OEM Safety requirements
- All applicable Transnet Engineering electrical safety and site requirements.

4. EQUIPMENT AND TECHNICAL REQUIREMENTS

4.1 Complete high voltage tester system

Supply one complete 15 kV high voltage tester with one compatible 30 kV power pack. The system shall include all interfaces, cables, test leads, clamps, fixtures, accessories, software and safety devices required for the specified tests. A Baker ADX 15 or technically equivalent system may be offered. Any equivalent shall be demonstrated by model-specific technical evidence.

4.2 Electrical and performance requirements

Ref.	Minimum requirement	Pass/Fail
4.2.1	Output controlled from approximately 2 kV continuous to a maximum of 15 kV.	
4.2.2	Grounded-supply monitoring and interlocks for safe operation.	
4.2.3	40 kV-rated test lead cable set compatible with the tester and power pack.	
4.2.4	Impulse generator suitable for high voltage windings on traction motors and armatures.	
4.2.5	User interface to be touch screen, mouse, keyboard, stylus	
4.2.6	Operating Platform must be Android or equivalent	
4.2.7	The display to be minimum 10.4 inches touch screen	
4.2.8	Surge test: maximum output 15 kV	
4.2.9	DC Hi-Pot: maximum output 15 kV; current resolution supporting 1/10/100 microampere ranges or equivalent to be observed on SAT	
4.2.10	30 kV power pack to include the necessary interface board and reach its rated voltage.	
4.2.11	Minimum internal storage capacity of 2 GB and USB data-transfer capability.	
4.2.12	A suitable selector switch for surge testing and visible safety/emergency test indication.	
4.2.13	Battery backup must have minimum 4 plus hours of standby time	
4.2.14	Step voltage 15kV	
4.2.15	DC high-potential (Hi-Pot) 15Kv	
4.2.16	Surge to 15kV	
4.2.17	Surge partial discharge (Surge PD) measured per IEC 61934	
4.2.18	Bar-to-bar test with suitable test probes	
4.2.19	Resistance measurement 0.001 Ω–100 KΩ	
4.2.20	Insulation Resistance 100 kΩ–1 TΩ	
4.2.21	Dielectric Absorption Ratio	
4.2.22	Polarization Index Ratio	

5. ACCESSORIES AND COMPLETENESS OF SUPPLY

The accessories below shall be compatible with the offered system and supplied as separate, identifiable pricing lines:

Spec. ref.	Required accessory	Minimum quantity
5.1	40 kV-rated test lead cable set	1 set
5.2	Compatible test clamps and connection accessories	1 set
5.3	Compatible colour printer with supported firmware	1 each
5.4	Spare printer ink cartridge	1 each
5.5	Suitable foot switch	1 each
5.6	Equipment trolley	1 each
5.7	Protective nylon cover	1 each
5.8	USB storage device, minimum 64 GB	1 each

Bar-to-bar and other application-specific fixtures shall be included in the tester/accessory supply and clearly identified in the bidder accessories list.

6. SOFTWARE AND LICENSING

- Provide all software required for testing, control, data storage, report generation and data export.
- Provide a perpetual or full-use licence transferred to Transnet on final acceptance, with no undisclosed recurring fee required for normal operation.
- Provide licence keys, passwords, set up guides and recovery instructions.
- The software shall support USB data transfer and generation of usable test reports.
- The bidder shall submit model-specific software information, screenshots and a sample report with the offer.

7. TESTING AND COMMISSIONING

7.1 Site Acceptance Testing (SAT)

SAT shall be conducted at the Transnet site and signed off by Transnet Engineering. SAT shall confirm operation under site conditions, all required functions, software/reporting, accessories and safety features.

7.2 Delivery and commissioning

The supplier shall provide delivery, off-loading, positioning in the selected Armature workshop test area, connection to existing 220V plug point with earth connection, configuration, commissioning, functional testing and handover. The printer will be placed on trolley adjacent to the high voltage tester. A project-specific plan shall state responsibilities, sequence, resources, safety controls, risks and programme. Commissioning shall be accepted only after successful SAT, demonstration of all specified functions and reports, closure of identified defects, completion of training, submission of all handover documents and signature of the commissioning certificate by Transnet Engineering.

8. TRAINING

Provide practical on-site Operational training for a minimum of six Transnet Engineering employees. The price shall cover the complete programme, trainer, materials and competency assessment. Provide onsite training for a minimum of three Maintenance Employees

- Safe operation, isolation, grounding, emergency response and test-area control.
- All specified test modes and selection of appropriate test parameters.
- Practical connection and testing of representative coils, windings and armatures.
- Software operation, data export, reporting and backup.
- Routine inspection, care, fault identification and maintenance requirements.
- Competency assessment and signed attendance register.4

Supply six training manuals, one per employee, in addition to the technical documentation sets.

9. DOCUMENTATION AND HANDOVER

Supply three hard copy sets and one complete electronic set. Electronic copies shall be supplied on the specified USB device and in searchable PDF/native formats where applicable.

Spec. ref.	Document
9.1	Operating manual
9.2	Maintenance manual including maintenance schedule
9.3	Electrical schematics and electrical parts list with manufacturer/supplier part numbers
9.4	Mechanical assembly drawings and mechanical parts list with manufacturer/supplier part numbers
9.5	SAT report according to Clause 7.1 conducted at TE workshop with the Client
9.6	Calibration
9.6.1	Laboratory Identification
9.6.2	Accreditation number
9.6.3	Calibration certificates
9.6.4	Relevant Schedule /Scope of accreditation

9.6.5	Tester serial Number
9.6.6	Functions/Ranges Calibrated
9.6.7	Calibration result
9.6.8	Traceability
9.6.9	Certificate date
9.6.10	Calibration status/next due date
9.6.11	Verification that the accredited scope covers the measurement undertaken
9.6.12	Uncertainty where applicable
9.7	Standard operating procedure
9.8	Software licence and backup information
9.9	Training records and competency results

10. WARRANTY

10.1	Minimum 12-month warranty for equipment and workmanship, commencing on final acceptance after SAT and commissioning.
10.2	Latent defects identified during the warranty period shall be corrected at the supplier's cost, including labor, travel, parts, transport and re-testing.
10.3	Defective items shall be repaired or replaced within the agreed turnaround period of one month.
10.4	Faults shall be acknowledged within 24 hours; an initial technical response shall be provided within 72 hours; and a corrective-action plan shall be issued within five working days.
10.5	The offer shall identify the support contact, response process, expected turnaround times of one month and any exclusions.
10.6	A warranty certificate and complete warranty terms shall be supplied at handover

1. DEFINITIONS AND ABBREVIATIONS

Term	**Meaning**
Client	Transnet Engineering Durban
Contractor / Supplier	Entity appointed under this specification
DA	Dielectric Absorption
Hi-Pot	High-potential dielectric test
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IR	Insulation Resistance
ISO	International Organization for Standardization
OHS	Occupational Health and Safety
PD	Partial Discharge
PI	Polarization Index
RIC	Rotor Influence Check
SANS	South African National Standard
SAT	Site Acceptance Testing
TE	Transnet Engineering
USB	Universal Serial Bus
VAT	Value-Added Tax

ANNEXURE A - SPECIFICATION-TO-PRICING ALIGNMENT MATRIX

Pricing item(s)	Specification clause(s)	Deliverable group
1-2	4.1, 4.3	Tester and 30 kV power pack
3-10	5.1-5.8	Test leads and accessories
11 & 12	6	Software, licensing and reporting
13	7.1	Site Acceptance Testing
14	9.6	Calibration
15	7.2	Delivery/Logistics
16 & 17	7	Connection and Site Integration
18 & 19	8	Training (Operational and Maintenance)
20-22	9.1-9.5	Documentation sets plus electronic copies
23	10	Warranty

Alignment rule: the pricing schedule item description, quantity and unit of measure shall be read together with the cited specification clause. The stricter minimum requirement applies where wording differs. Any clarification issued by Transnet forms part of the tender documents.