



A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

REQUIREMENTS FOR THE STAGGER AND HEIGHT MEASURING GAUGE

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Four handwritten signatures are shown, each on a horizontal line. From top to bottom, they correspond to S.S Fikeni, N.G Maela, Gift Sebaka, and K. Motupa.

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LIST OF AMENDMENTS TO THE SPECIFICATION

Version No.	Date Issued	Clause No.	Page No.	Remarks
01	06 Aug 2013	All	All	Original version
02	11 June 2021		All	Second version
03	11 March 2022		01	POPIA declaration statement inserted
		4.3.1	5	Amended highest AC permanent system voltage from 55kV AC to 60kV AC
		5.1	5	Referencing to maintenance instruction has been removed
		6.3	5	Amended clause 6.3 for contact wire stagger
		6.5	5	Referencing to Transnet internal report has been removed
		6.8	6	Amended clause for the minimum wire diameter from 11.25mm to 8mm
		8.6	7	Amended clause for calibration of measuring instrument
		13.1	8	Amended clause 12.1 as per clause 7.10 of Calibration of Rolling stock/Infrastructure Measuring Instruments and Legal Metrology Requirements
		15.0	8	Method of tendering changed to technical compliance
		15.0	8	Documents requirements divided into documents to be submitted by all tenderers and documents to be submitted only by the successful tenderer
		1.4	4	Clause explaining the use of Appendix B has been removed
				Appendix B Technical data sheet has been removed

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1.0 SCOPE

- 1.1 This specification details Transnet's requirements for the supply of a stagger and height measuring gauge capable of measuring at least the contact wire, catenary wire and feeder wire on 3kV DC, 25kV AC and 50kV AC electrified lines utilizing laser measurement technology.
- 1.2 The stagger and height measuring gauge will be used to measure the following geometrical parameters: stagger, contact wire height above rail level, bridge and tunnel heights and the distances from rail centre to the mast pole, bridge pillars or tunnel wall.
- 1.3 This specification contains schedule of requirements (Appendix A) which must be completed by the relevant Transnet Representative.

2.0 BACKGROUND

- 2.1 Transnet makes use of electrified locomotives that source power from an overhead contact wire. The wire is installed within certain parameters to ensure optimal operation with the pantograph. The contact wire is measured to ensure that parameters such as height and stagger are within limits. These limits alleviate excessive wear of the pantograph carbon contact strips. The contact wire height ensures that the pantograph remains within operational reach and the traverses smoothly.
- 2.2 The stagger and height gauge is also used to measure heights of bridge soffit, tunnel ceiling, feeder wire, catenary wire and contact wire installed inside the tunnel to ensure safe clearances.

3.0 NORMATIVE REFERENCES

Unless otherwise specified all materials used, equipment developed and supplied shall comply with the latest edition of the relevant International Electro-technical Commission (IEC), International Organization for Standardization (ISO), South African National Standards (SANS) or Transnet publications.

3.1 SANS STANDARD:

- | | | |
|-------|------------|---|
| 3.1.1 | SANS 9001 | Quality management systems- Requirements |
| 3.1.2 | SANS 17025 | General requirements for the competence of testing and calibration laboratories |
| 3.1.3 | SANS 60529 | Degrees of protection provided by enclosures (IP code) |

4.0 SERVICE CONDITIONS

4.1 ENVIRONMENTAL CONDITIONS

Altitude:	0 - 1800 m above sea level
Relative humidity:	10% to 90%
Ambient temperature:	-10° C to +55° C
Wind pressure:	750 Pa
Lightning conditions:	20 ground flashes/km ² per annum
Pollution:	Heavily salt laden with industrial pollutants including diesel- electric locomotive emissions

4.2 MECHANICAL SERVICE CONDITIONS

- 4.2.1 The stagger and height gauge will be exposed to vibration and shock during transportation on gravel road and possible shock on impact when operating the device.

4.3 ELECTRICAL SERVICE CONDITIONS

- 4.3.1 The instrument doesn't need to be insulated from the voltage specified in table 1 as it is not to be used in direct contact with the "live" equipment, but must be able to continuously operate safely approximately 3m away from equipment with the following electrical conditions:

Table 1: OHTE System Voltage Parameters

Nominal DC System Voltage	3kV DC
Highest DC Permanent System Voltage	4.5kV DC
Lowest DC Voltage of System	2.2kV DC
Typical current for 3kV DC	4000A
Nominal AC System Voltage	25kV AC
Highest AC Permanent System Voltage	31kV AC
Lowest AC Voltage of System	19kV AC
Typical current for 25kV AC	800A
Nominal AC System Voltage	50kV AC
Highest AC Permanent System Voltage	60kV AC
Lowest AC Voltage of System	28kV AC
Typical current for 50kV AC	800A

- 4.2 During use the measuring equipment will bridge rails, hence it must not be conductive to prevent interfere with the track circuits.

5.0 GENERAL REQUIREMENTS

- 5.1 The instrument shall not be fragile and must be portable for ease of storage and transportation.
- 5.2 The measuring instrument shall be able to measure the desired parameters on all track configurations used by Transnet (including turnouts, under bridges and inside tunnels).

6.0 TECHNICAL REQUIREMENTS

- 6.1 Transnet requires a measuring device utilizing laser technology to measure track clearance from objects adjacent to the track, height and stagger of the contact wire, height of the catenary and feeder wires, and height of bridge soffits and tunnel ceilings.
- 6.2 The mass of the measuring gauge shall not exceed 9kg.
- 6.3 The measuring gauge shall be adjustable to fit the Transnet track gauge (1065mm to 1105mm).
- 6.4 The measuring gauge shall be able to measure up to 1200mm of contact wire stagger.
- 6.5 The measuring gauge shall have a stagger measuring accuracy of at least ± 10 mm.
- 6.6 The measuring gauge shall be capable to measure a height of up to 10m above rail level.

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- 6.7 The measuring gauge shall have a height measuring accuracy of at least $\pm 5\text{mm}$ and a resolution of 1mm.
 - 6.8 The measuring instrument shall measure the distances between centre of the track and the objects adjacent to the track of at least 10m away.
 - 6.9 The measuring instrument shall be able to measure the parameters (height and stagger) for wires with a minimum diameter of 8mm and a laser marker shall be visible enough to the operator to locate it.
 - 6.10 The measuring gauge shall have an "Auto power off" when unattended for a period exceeding 10 minutes.
 - 6.11 The enclosure of the measuring instrument shall have a minimum protection degree of IP65 in accordance to SANS 60529.
 - 6.12 The measuring instrument shall be operated without making contact with any live Overhead line/equipment.
 - 6.13 The measuring instrument shall use laser distance measurement technology.
 - 6.14 The operator shall be able to clearly see the laser location marker, height measurements and stagger readings in all weather conditions and the device shall have anti-glare properties.
 - 6.15 The measuring instrument shall have a rechargeable battery to enable full operation for at least 8 hours of continuous use and the battery level shall be indicated.
 - 6.16 The service life of the battery shall be a minimum of 3 years.
 - 6.17 The maximum battery recharge time from empty to fully charge shall be no more than 4 hours.
 - 6.18 The battery recharge circuit shall automatically shut off when battery is fully charged.

7.0 TESTING AND INSPECTIONS

- 7.1 Site Acceptance Test (SAT) conducted upon delivery by the successful tenderer in the presence of representatives from Transnet Freight Rail. The following must be clearly described by the successful tenderer:
 - Test Objective
 - Sequence of activities
 - Acceptance criteria
- 7.2 Transnet reserves the right to be present at all tests and inspections as called for in this clause.
- 7.3 The supplier will assist the Transnet Freight Rail representative in the commissioning of all equipment supplied by conducting verification with manual gauge that will be availed by Transnet personnel.
- 7.4 The successful tenderer shall be responsible to arrange commissioning tests called for in this specification.
- 7.5 A Transnet Freight Rail, Technology Management (Electrical Technology) department representative may request any additional test deemed necessary to ensure compliance.

8.0 RATING PLATE AND INSTRUCTION LABEL

- 8.1 The stagger and height gauge shall be provided with data plate, securely fix thereto, and indicating the maker's name, type and serial number.

9.0 MAINTENANCE REQUIREMENTS

- 9.1 The tenderer shall provide a complete list of serviceable items and tools required to conduct the service.
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- 9.2 Special or servicing tools required for maintenance/repair shall be quoted separately.
 - 9.3 Spares and consumables replacement parts such as fuses and batteries shall be readily available in South Africa.
 - 9.4 Spare Parts Availability: When applicable, the Supplier shall certify the availability of spare parts for a period of at least five (5) years from date of delivery, or as otherwise specified in this specification or in any Purchase Order.
 - 9.5 The manufacturer shall submit a list of recommended spares, showing a separate price for each item.
 - 9.6 Maintenance intervals of the measuring gauge shall be prescribed by the manufacturer.
 - 9.7 If no SANAS accredited calibration laboratory in South Africa can perform the calibration under their accreditation then a non-SANAS accredited calibration laboratory that is traceable to international and national standard is allowed, if a written authority is provided by Transnet Freight Rail, Technology Management (VIT Metrology) currently located at the Railway Technology Development Centre in Koedoespoort.
 - 9.8 The manufacturer shall offer after sale support for the measuring gauge.

10.0 DOCUMENTATION REQUIREMENTS

- 10.1 Drawings and documents shall be written in English.
- 10.2 Drawings shall be submitted with tender.
- 10.3 All units indicated in the documentation shall be in metric system.
- 10.4 The supplier must provide one copy of the technical specification.
- 10.5 The supplier must provide one copy of the method of assembly and operation of the measuring gauge.
- 10.6 The supplier must provide one copy of the maintenance manual.
- 10.7 The supplier must provide either an original equipment manufacturer calibration certificate, calibration certificates from a SANAS or International accredited calibration laboratory traceable to National Standards or International Standards.
- 10.8 The supplier shall provide the technical datasheet of the battery specified in clause 6.15 up to clause 6.18.
- 10.9 The file containing documents and drawings should be numbered for easy identification and reference purposes.
- 10.10 TFR reserves the right to require any additional information: manuals, catalogues, drawings, etc. that may contribute to complete information supplied by the manufacturer.

11.0 QUALITY ASSURANCE

- 11.1 The successful tenderer shall maintain a Quality Management System (QMS) based on or certified to ISO 9001.
- 11.2 The scope of activities indicated in the certificate should cover the scope of work called for in the specification (i.e. Design, testing and manufacturing).
- 11.3 The successful tenderer shall submit preliminary quality control plan clearly indicating hold points during the design, manufacture, installation and transportation of the stagger and height gauge.

12.0 TRAINING

- 12.1 The Supplier must describe the necessary training programme available for the maintenance and operation of the equipment offered as well as the cost.
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13.0 PACKAGING, STORAGE AND HANDLING

- 13.1 To ensure valid measurement results, measuring instrument shall be protected from damage during transport, handling, maintenance and storage.
- 13.2 Where possible, complete assemblies must be crated together. Each crate must contain a checklist of components in the crate. Where smaller components are grouped together for packaging, checklists must accompany each individual packaging.
- 13.3 Should one assembly be packaged in more than one crate – it should contain a serial number with its package number. E.g. 20200715001 part 1 of 3.
- 13.4 Outside of packing must be marked with:
- Order/ Contract number.
 - A List of parts and quantities
 - Such other information as requested by Supply Chain Services.
- 13.5 Each assembly must be accompanied by an assembling instruction set in the packaging.

14.0 GUARANTEES AND DEFECTS

- 14.1 The successful tenderer shall accept liability for makers' defects, which may appear in design, material and workmanship.
- 14.2 The successful tenderer shall provide all information regarding guarantees and warranties in writing
- 14.3 The appointed tenderer shall guarantee that the supplied stagger and height measuring gauge conforms to Transnet's requirements.
- 14.4 The appointed tenderer shall provide a spare parts list with contact details with each item, including the instructions.
- 14.5 Lead time must be clearly indicated by the approved tenderers.

15.0 TECHNICAL COMPLIANCE

- 15.1 Tenderer(s) shall indicate clause-by-clause compliance document with the specification. This shall take the form of a separate document listing each of the specification's clause and sub-clause numbers, indicating the individual statements of compliance or non-compliance.
- 15.2 Statement of non-compliance shall be motivated by the tenderer, as per 15.1.
- 15.3 Tenderer(s) shall submit all technical documents called for in the specification.
- 15.4 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet. The tenderer(s) shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognized standard specification(s) with which it complies. Any deviations must be approved by Transnet Freight Rail, Technology Management (Electrical Technology) department in writing.
- 15.5 Failure to comply with clauses 15.1, 15.2, 15.3 and 15.4 could preclude a tenderer from consideration.
- 15.6 In the event of any conflict between the various submitted relevant documents, the order of precedence shall be, and in consultation with Transnet Freight Rail, Technology Management (Electrical Technology) department:
- a) Legal and safety requirements.
 - b) This Specification.

END

APPENDIX A: SCHEDULE OF REQUIREMENTS

(To be completed by Transnet Representative)

1	Name of depot / Department		
2	Quantity		
3	Training required		
4	Special requirements	<div>.....</div> <div>.....</div> <div>.....</div> <div>.....</div> <div>.....</div> <div>.....</div> <div>.....</div> <div>.....</div>	

Completed by:	
Capacity:	
Signature:	
Date:	

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