	work instructions	Group/Division/ Generation/Duvha Power Station
---	--------------------------	---

Title: **CALIBRATION AND SERVICE OF
PERFORMANCE AND TESTING
TEST EQUIPMENT**

Document Identifier: **PT0003**

Alternative Reference
Number:

Area of Applicability: **Duvha Power Station**

Functional Area: **Engineering – Performance
and Testing**

Revision: **4**

Total Pages: **9**

Next Review Date: **August 2026**

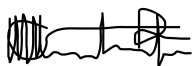
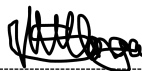
Disclosure
Classification: **Controlled Disclosure**

Compiled by

Supported by

**Functional
Responsibility**

Authorized by



**P. Matumba
Technician**

**N. Mhlana
Senior Technician**

**U. Kaphengst
P&T Manager**

**M. Mamoleka
Engineering
Manager**

Date: 02/08/2023

Date: 02/08/2023

Date: 2023-08-02

Date: 2023-08-02

Content

Page

1. Introduction.....	3
2. Supporting Clauses	3
2.1 Scope.....	3
2.1.1 Purpose.....	3
2.1.2 Applicability	3
2.1.3 Effective date.....	3
2.2 Normative/Informative References	3
2.3 Definitions	4
2.4 Abbreviations	4
2.5 Roles and Responsibilities	4
2.6 Process for Monitoring.....	4
2.7 Related/Supporting Documents.....	4
3. Calibration equipment.....	4
3.1 Risk Assessment, Health and Safety Precautions and Hazards	4
3.2 General	5
3.3 Calibration and service of equipment.....	5
3.3.1 Digital thermometer	5
3.3.2 Oxygen test gas cylinders (various).....	5
3.3.3 Tachometer	5
3.3.4 Inclined box manometers.....	5
3.3.5 Ultrasonic flow meter	6
3.3.6 Oxygen analyzers.....	6
3.3.7 Scale 0 – 150kg: Avery CTR	6
3.3.8 Scale 0 – 400g: Sartorius Universal.....	7
3.3.9 Shaw H ₂ Dew point meter	7
3.3.10 Fritsch Analysette (Automatic Shaker).....	7
3.3.11 Cyclostatic pulverized fuel sampler.....	7
3.3.12 Optical pyrometer.	7
3.3.13 Standard test pressure gauge (various).....	7
3.3.14 Measuring ropes.....	7
3.3.15 Electronic manometer.....	7
3.3.16 Ultrasonic Acoustic.....	7
3.4 Records.....	8
4. Acceptance.....	8
5. Revisions.....	9
6. Development Team	9
7. Acknowledgements	9

1. Introduction

The primary significance of calibration and servicing is that it maintains accuracy, standardization, and repeatability in measurements, assuring reliable benchmarks and results. Without regular calibration, equipment can fall out of spec, provide inaccurate measurements, and threaten quality, safety, and equipment longevity. The application of this work instruction will ensure that P&T test equipment is properly calibrated and serviced, and the associated documentation, where applicable is correctly recorded. It also highlights, where applicable, special measures must be taken when using the equipment.

2. Supporting Clauses

2.1 Scope

This work instruction covers all P&T equipment which is capable of being calibrated or which requires servicing.

2.1.1 Purpose

The purpose of this work instruction is to ensure that all equipment purchased or otherwise acquired by the P&T that needs service and calibrations has been calibrated and maintained according to the standard and are reading within their specifications; ensuring that calibration and service certificates are well documented.

2.1.2 Applicability

This document shall apply throughout the Performance & Testing department Duvha Power Station.

2.1.3 Effective date

This Work Instruction will be effective on the date of authorisation.

2.2 Normative/Informative References

SABS 0157 Part 1 – 1987

PTP0006 – Verification of the integrity of the contents of oxygen test gas cylinders

Kemper's Engineering Yearbook 1991

Trade Metrology Act

03A-PTI0001 - calibration of master test equipment at Duvha Power Station

2.3 Definitions

Test Equipment	Any equipment used for the purpose of taking measurements or obtaining information during a test (i.e., a thermometer is test equipment, but a ladder used to gain access to a monitoring point during a test is not.)
----------------	--

2.4 Abbreviations

Abbreviation	Explanation
P&T	Performance and Testing Department of the Engineering Group, Duvha Power Station.
SANAS	South African National Accreditation System

2.5 Roles and Responsibilities

It is the responsibility of the P&T Manager to ensure that persons using P&T test equipment are made aware of the requirements of this procedure.

It is the responsibility of the person using P&T equipment to ensure that it complies with the requirements of this procedure.

2.6 Process for Monitoring

N/A

2.7 Related/Supporting Documents

N/A

3. Calibration equipment

3.1 Risk Assessment, Health and Safety Precautions and Hazards

1. Personnel, plant, and equipment safety precautions are to be always observed.
2. Wear eye protection, a respirator and hand protection when replacing manometer fluid or determining the fluid density.
3. Drive safely and adhere to road regulations while servicing or calibrating the conveyor belt scales. Ensure you have your private and Eskom driver's license with you.

3.2 General

1. All test equipment capable of being calibrated, as identified in this work instruction, shall be calibrated and/or serviced at the intervals recommended in this work instruction by a competent person or organisation and must be S.A.N.A.S accredited, as identified by the P&T Equipment Register. In this regard an indication that the equipment has been calibrated and/or serviced shall be firmly attached to the equipment (equipment which must be calibrated each time it is used is excluded from this requirement with regards to indication of calibration only). This indication shall include the following information regarding the calibration/services: date and name of organization or person who carried out calibration/ service, and the date on which next calibration/ service is due.
2. All old calibration/ service indications shall be removed from the equipment before the new calibration is attached.
3. The calibration and servicing requirements of all new test equipment acquired by P&T shall be identified prior to its use and identified as such in the P&T Equipment register.
4. Test equipment identified in this work instruction shall not be used unless it fulfills the requirements of this work instruction.

3.3 Calibration and service of equipment

The following equipment should be calibrated and serviced as detailed below:

3.3.1 Digital thermometer

These are to be calibrated once per year together with the appropriate thermocouples. J type thermocouples should be used if possible as they are less subject to drift than K type. at least one thermocouple per digital thermometer should be calibrated over the range of 0 - 550 degrees Celsius. A list of the thermocouple's ideas with which the digital thermometer has been calibrated together with their correction factors shall be affixed the digital thermometers. The digital thermometers are only to be used with the instrument with which they have been calibrated (as specified in the calibration certificates).

3.3.2 Oxygen test gas cylinders (various)

Oxygen test gas cylinders should only be used once they have complied with procedure PTP0006.

3.3.3 Tachometer

These are to be calibrated once per year.

3.3.4 Inclined box manometers

- **Calibration:** One of these, in succession, should be calibrated by an independent authority every year (as indicated by manufacturer). the other three inclined manometers should then be calibrated against it by a competent person within the P&T department. they after the four inclined manometers should be checked against each other every six months. If a significant discrepancy is found between them one of them should again be sent to an independent authority for calibration and the process is repeated.

- **Service:** Furthermore, every two weeks, or before any calibration checks are undertaken, the fluid must be checked to ensure that its density is correct to within 1% of the specified density. The specified fluid density is 0.784 g/cm³ (Or a specific gravity SG of 0.7854). This should be performed as follows

- 1) Pour the fluid from the inclined manometers reservoir (or the new fluid) into a suitable container.
- 2) Insert a suitable hydrometer into the container.
- 3) Ensure that the hydrometer is floating freely and is not resting on the bottom of the container.
note the reading of the hydrometer at the surface of the fluid.
- 4) If the reading is greater than 0.792 g/cm³ or less than 0.776 g/cm³ the fluid should be discarded and step one and two repeated with new fluid.
- 5) If there is between 0.792 g/cm³ and 0.776 g/cm³ inclusive the fluid should be placed in the inclined manometer reservoir and the manometer made ready for use.

3.3.5 Ultrasonic flow meter

These are to be calibrated once per year.

3.3.6 Oxygen analyzers

Calibration: The analyzer must be recalibrated and checked every time they are used. The calibration and check should be carried out as follows:

- 1) Place the analyzer where it is to be used and check the battery level. ensure that the filter is clean.
- 2) Leave it for a minimum of 20 minutes so that it reaches the temperature of the surrounding air. the temperature of the instrument affects the calibration.
- 3) Connect the analyzer with the calibration O₂ gas cylinder using the analyzer hose. (Ensure the gas pressure is minimal as not to damage the analyzer diaphragm of the pump)
- 4) Wait until the oxygen reading settles completely then record the readings for gas correction.
- 5) The analyzer is ready for use.

If the analyzer is moved a significant distance from where it was initially calibrated, or if the temperature changes, or if the test lasts a considerable time, the calibration should be checked again.

The following points should be noted when using the analyzer:

- The analyzer should not be used to sample for longer than 20 minutes at a time, after which it must be purged for at least two minutes with atmospheric air.

Servicing: The analyzer should be serviced/inspected by the local agent once a year or when their condition requires it. If problems are experienced with a calibration of the analyzer or if excessive drift occurs the oxygen cell should be replaced if necessary.

3.3.7 Scale 0 – 150kg: Avery CTR

This scale must be calibrated once per year

3.3.8 Scale 0 – 400g: Sartorius Universal

This scale must be calibrated once a year.

3.3.9 Shaw H₂ Dew point meter

This should be used in accordance with PTP 0012 – H₂ dew point test on generator cooling

3.3.10 Fritsch Analysette (Automatic Shaker)

This should be serviced once every two years.

The laboratory test sieves should be checked prior to the use and if damaged they should be discarded.

3.3.11 Cyclostatic pulverized fuel sampler

These samplers should be serviced/maintained once a year or when otherwise required

3.3.12 Optical pyrometer.

The optical handheld pyrometer should be calibrated once per year.

3.3.13 Standard test pressure gauge (various)

These standard test gauges are to be calibrated once per year.

These weights are to be calibrated once per year in accordance with their trade metrology act.

3.3.14 Measuring ropes

The ropes used for measuring the Staithe and bunker levels during the course survey should be checked and calibrated once every six (6) months. If they are damaged, they must be discarded and replaced.

3.3.15 Electronic manometer

These must be calibrated once per year together with the appropriate pressure transducers.

The electronic manometer is only to be used with the pressure transducers with which it has been calibrated (as specified in the calibration certificates).

3.3.16 Ultrasonic Acoustic

This will only be maintained when damaged and/or if the instrument cannot pick up sound when in use.

3.4 Records

All documentation relating to the calibration/service (including instruction manuals, calibration certificates, correction factors, calibration reports, service/maintenance instructions, service records and operating instructions etc.) shall be filed. This shall be done in such a manner that they are easily retrieved and accessible to all persons using the associated equipment.

All documents relating to calibration, service/maintenance and operating instructions are to be kept together in separate files. Scans shall be made and stored on the G drive.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Phathu	Technician
Uwe	P&T Manager
Maila	Engineering Manager

5. Revisions

Date	Rev.	Compiler	Remarks
August 2023	4	P. Matumba	1. revision of the procedure to work instruction 2. inset introduction, effective date, and applicability on page 3 3. change Purpose on page 3 4. separate abbreviation and definitions page 3 5. change PTE to P&T 6. change the heading actions to process for monitoring 7. change the numbering on process for monitoring 8. updated general on page 5 9. updated the O2 analyser page 6 10. abbreviated SANAS 11. added Ultrasonic Acoustic on page 7 12. removed 3.1.3.14 to 3.1.3.16
June 2017	3		Minor changes to paragraph 4, 5, 6.2.1 - 6.2.4, 6.3.1 - 6.3.5, 6.3.6, 6.3.7, 6.3.16, 6.3.18, 6.3.19 & cover page
February 2011	2		Minor changes to paragraph 4, 6.3.6, 6.3.7, 6.3.10, 6.3.11, 6.3.13, 6.3.16, 6.3.19
March 2005	1		Change on pages 1-10 and front page
September 1994	0		Original

6. Development Team

The following people were involved in the development of this document:

- P Matumba

7. Acknowledgements

N/A