Eskom	ADMINISTRATIVE PROCEDURE	Allocation Centre 38A	Reference Number KAA-595	Rev 6
NNR: NO **No.:**	CONTROL OF CHEMISTRY INSTRUMENTATION, ANALYSERS AND EQUIPMENT			PAGE 1

KORC	ACCESS	IMPORTANCE CATEGORY	NEXT REVIEW DATE	DATE AUTHORISED
NO	Nuclear Restricted	NSA	2021-12-13	2018-12-13

COMPILED / REVISED	REVIEWED	AUTHORISED
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HEAD OF CHEMISTRY SUPPORT	HEAD OF RADIOCHEMISTRY (ACTING)	CHEMISTRY MANAGER
DATE 2018-12-11	**DATE** 2018-12-13	**DATE** 2018-12-13

THIS PROCEDURE HAS BEEN SEEN AND ACCEPTED BY:

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FCA	ALARA REVIEW	SUPERSEDES
MONITORING	YES 2018-12-11	KAA-595, Rev 5 dd. 2017-07-28 FULL REVIEW

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1.0 PURPOSE

1.1 To describe the process and responsibilities for the control, calibration and maintenance of Chemistry instrumentation and equipment.

2.0 SCOPE

2.1 Applicable to all Chemistry instrumentation and equipment that requires calibration and/or maintenance.

2.2 This includes all laboratory analysers, equipment and all radiochemistry-related measuring equipment.

2.3 Installed in-line and on-line analysers that are maintained on a routine basis by Chemistry.

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.1.1 **Analyser** – A non-manual measuring device or data processor used in the laboratory or on the plant (in which case it will have a trigramme). This term is often used interchangeably with “instrument”.

3.1.2 **Calibration** – To graduate an instrument against a known reference so that it performs within an acceptable specification range. This may be either an electronic or a chemical reference.

3.1.3 **Consumables** – Items with a limited life-time which are used, replaced and then discarded. Electrodes, tubing, flow cell windows for turbidity meters, reagents, membranes for dissolved oxygen meters, etc.

3.1.4 **Equipment** – Items which are not instruments but which form an integral part of an instrument or analyser, e.g. a cathode lamp, or a manual measuring device.

3.1.5 **In-line Analyser** – An analyser where the measuring probe is located inside the actual process stream, e.g. a conductivity electrode in the pipe through which the system water flows. The terms in-line and on-line are commonly interchanged in industry.

3.1.6 **Instrument** – A non-manual measuring device or data processor used in the laboratory (it does not have a trigramme). This term is used interchangeably with “analyser”.

3.1.7 **Inoperable** – An instrument that is not operable (refer to 3.1.9).

3.1.8 **On-line Analyser** – An analyser where the sample is directed (normally continuously) from the process stream via a sample line to the measuring probe. The probe is not located inside the actual process stream. Almost all of the analysers used at Koeberg fall into this category.

3.1.9 **Operability** – State of instrument where it is functioning correctly with no faults, within acceptance criteria and is in-service or can be placed in service at short notice.

3.1.10 **Standardisation** – The adjustment performed to an instrument, with the aid of a chemical standard, to ensure correct and accurate operation.

3.1.11 **Available** – Calibrated and QC qualified, and ready for analysis.

3.2 Abbreviations

3.2.1 **Cal Lab** – Calibration Laboratory, a Section of the IMS Group which performs the electronic calibration of instruments

3.2.2 **CE** – Component Engineering

3.2.3 **ICA** – A section of IMS that deals with instrumentation pertaining to the Nuclear Auxiliary Building and the Reactor Building

3.2.4 **ICB** – A section of IMS that deals with instrumentation pertaining to the Turbine Hall and Outside Plant

3.2.5 **IMS** – Instrument Maintenance Services

3.2.6 **M & TE** – Measuring and Test Equipment

4.0 REFERENCES

4.1 Referenced Documents

4.1.1 335-2, Rev 4: Koeberg Nuclear Power Station Management Manual

4.1.2 KAA-500, Rev 13: The Process for Controlled Documents

4.1.3 KSA-011, Rev 14: The Requirements for Controlled Documents

4.1.4 KSC-003, Rev 5: The Chemistry Programme

4.1.5 KSC-004, Rev 5: The Analytical Chemistry Quality Control Programme

4.1.6 KWC-AC-001, Rev 13: Implementation of the Analytical Chemistry Quality Control Programme

4.2 Applicable Documents

4.2.1 KAA-640: Control of Items Leaving Site for Repair or Service

4.2.2 KAA-679: Control and Operation of the Measuring and Test Equipment at Koeberg Nuclear Power Station

4.2.3 KSC-001: The Radiochemistry Quality Control Programme

4.2.4 KWH-B-015: External Dosimetry Control

4.2.5 KWC-AC-002: Maintenance and Service of Analytical Chemistry Laboratory Equipment and Instrumentation

4.2.6 KWC-AD-001: Management and Control of Chemistry Records

4.2.7 KWC-PC-001: Calibration and Maintenance of Chemistry On-line Analysers

5.0 RESPONSIBILITIES

5.1 The Chemistry Manager is responsible for ensuring that the implementation of this procedure is adhered to.

5.2 Further responsibilities are described in the Work Flow Responsibility Matrices (Appendices 1 and 2).

6.0 PROCESS

6.1 Generic Principles

Each analytical technique/instrument should have a back-up. The management of the availability of the instruments and backups must take cognisance of the risk associated with the technique/instrument being unavailable, i.e.:

- The consequences of unavailability.
- The likelihood (frequency) unavailability.
- The likely duration of unavailability.
- In-house capability to recover.
- Service contract in place and the need to have such.
- Response time of external service provider.
- Replacement time of instruments and/or parts.

- The likelihood of recovery.

The recovery plans for instruments must mitigate unavailability such that the consequences are adequately avoided.

6.2 Refer to the Work Flow Responsibility Matrices (Appendices 1 and 2).

NOTE: *When an external instrument contractor is called in to repair an instrument, a purchase order number must be obtained prior to work being carried out.*

6.3 The minimum required no. of instruments (and/or method of analysis) for critical analysis is stipulated in appendix 3.

6.4 Specific Requirements

6.4.1 Critical Analysis

Instruments or Analysis of which the function and availability are deemed critical are those which could:

- Have Nuclear Safety Consequences (OTS LCOs)
- Have Radiological Consequences (Dose)
- Impact Radiological Effluent Releases
- Cause Unit Shut Down
- Cause a non-compliance to/with a standard that is license binding

6.4.2 Critical Instruments shall comply with the following:

- At least one alternative analysis methodology and/or back-up instrument shall be operable and available at all times. Routine Calibrations and planned services are not deemed to render an instrument inoperable, provided that such work is completed within the usual time frames. Any delays in returning the instrument to service shall be deemed as an inoperability event.
- Obsolete instruments shall be deemed non-compliant to this requirement. In the event of inadvertent obsolescence, replacement shall be initiated immediately and as a matter of priority.
- Power supply shall be via a UPS to protect against power surges and ensure availability. The UPS capacity (hours of supply) shall be adequate to prevent the consequences, and/or back-up plan for establishing alternative supply shall be in place.

6.5 All required instrument spares must be maintained in stock at all times.

6.6 All instruments must be replaced after every ten years from the date of purchase or when the OEM renders the instrument obsolete within the ten years.

6.7 All contractors who perform work on the Chemistry Instrumentation must meet all FFD requirements as specified in the station procedures.

6.8 Contractors who need to perform work in the controlled zone and have not done Radiation Worker Training are given special persons authorisation as per procedure KWH-B-015. A Koeberg authorised person assists the contracted technician with plant isolations, Koeberg working procedures and other Koeberg processes such as PSR requirements.

7.0 RECORDS

7.1 Records resulting from this process are internal to Chemistry.

NOTE: *Applicable to Chemistry only.*

7.2 The records of calibrations, standardisations and a history of repairs and maintenance must be retained for the life of the instrument. These records must be archived in accordance with KWC-AD-001.

7.3 Instrument and equipment manuals (Chemistry owned) must be retained in the Chemistry documentation safe.

8.0 ATTACHMENTS

Appendix 1 – Work Flow Responsibility Matrix – Receipt of New Instruments

Appendix 2 – Work Flow Responsibility Matrix – Calibration and Service of Chemistry Equipment and Instrumentation

Appendix 3 – Minimum Required no. of Instruments (and/or Method of Analysis) for Critical Analysis

Appendix 4 – Justification

WORK FLOW RESPONSIBILITY MATRIX	**APPENDIX 1 – RECEIPT OF NEW INSTRUMENTS**

R – Responsible
A – Approve
F – File
• – Outside Matrix Scope
Y/N or N/Y – Decision
C – Concur
I – Informed
S – Service
[ ] – Mandatory Requirement
( ) – As Appropriate/Required
Flow Path:
Main Flow ⟷ Secondary Flow

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	**NOTES & REFERENCES**
	ORGANISATION / FUNCTION												
		CHEMISTRY HEAD OF SECTION/INSTRUMENT TECHNICIAN		CHEMISTRY SERVICES		CHEMISTRY TRAINING		IMS					
1. Chemistry to verify calibration requirements.		[R]						(C)					Refer to instrument manual. For Lab instruments refer to KFC-AC-009
2. Design engineering must provide a new trigramme.		(R)						(S)					[1] Cal Lab – if service required. [2] ICA / ICB
3. Chemistry must determine maintenance requirements.		[R]						(C)					Set up service contract if required. Refer to instrument manual.
4. Arrange for routine calibration and maintenance, where applicable.		[R]						(S)					For instrumentation that requires IMS calibration and/or maintenance.
5. Include instrument in section record system.		[R]						(R)					
6. Prepare and authorise procedures for the use of the instrument.		[R]											This can include calibration, maintenance and operating procedures.
7. Place the instrument in service.		[R]											
8. Update the training programme.		(C)				[R]							
9. Store the instrument manual in the Chemistry Documentation Safe.				[R]									
10. Establish stock that needs to be kept in Chemistry stores.		[R]		(C)									
11. Requisition spares/consumables as required.		(C)		[R]									
12. Maintain the agreed minimum stock level.		(C)		[R]									

WORK FLOW RESPONSIBILITY MATRIX	**APPENDIX 2 – CALIBRATION AND SERVICE OF CHEMISTRY EQUIPMENT AND INSTRUMENTATION**

R – Responsible
A – Approve
F – File
• – Outside Matrix Scope
Y/N or N/Y – Decision
C – Concur
I – Informed
S – Service
[ ] – Mandatory Requirement
( ) – As Appropriate/Required
Flow Path:

Main Flow ⟷ Secondary Flow

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	**NOTES & REFERENCES**
		ORGANISATION / FUNCTION											
		CHEMISTRY HEAD OF SECTION/INSTRUMENT TECHNICIAN		CHEMISTRY SERVICES		CHEMISTRY TRAINING		IMS		INSTRUMENT CONTRACTOR			
1. Service/calibration requirement initiated from SAP for M & TE.		[1][•]						[2][•]					[1] KSC-001 KWC-PC-001 KWC-AC-002 [2] KAA-679
2. Print / View list from SAP of M & TE that is due for calibration and deliver M & TE to calibration lab.		(R)											
3. Instrument made available for service/calibration by Chemistry to IMS/calibration lab.		[R]											Alternative available if required.
4. Instrument declared as inoperable and tagged as inoperable.		[R]											Inform all applicable users.
5. Service/calibration performed.		[R]						(R)		(R)			
6. Service/calibration successful.		Y/N											Go to activity no. 7. Follow KAA-640 when sending instrumentation off-site.
7. Repair of instrumentation successful and instrument returned to site.										[•]			
8. Instrumentation placed in service and declared operable. Tags removed.		[R]											Inform all applicable users.
9. Instrument history records updated.		[R]											

APPENDIX 3

MINIMUM REQUIRED NO. OF INSTRUMENTS (AND/OR METHOD OF ANALYSIS) FOR CRITICAL ANALYSIS

1) Analytical Chemistry

- 2 x Atomic Absorption Instrument for Lithium analysis on RCP and Boron and Sodium analysis on waste tanks
- 2 x Autotitrator for Boron analysis on RCP and other borated systems in the primary circuit
- 2 x Dissolved Hydrogen analyser
- 2 x Dissolved Oxygen analyser
- 2 x pH meter
- 2 x Conductivity meter
- 2 x Ion Chromatography for anion analysis
- 2 x Ion Chromatography for cation analysis
- 2 x Sodium analyser
- 2 x UV/VIS instrument for Hydrazine analysis

2) Radiochemistry

- A minimum of 5 Gamma Detectors should be in service.
- 2 x Alpha Beta Counter
- 2 x LSC Counter

APPENDIX 4

JUSTIFICATION

Revision 4

1. Full review.

Revision 5

1. Full Review – Update of information.

Revision 6

1. Define generic principles for Chemistry instrumentation in 6.1.
2. Specify minimum required instruments in 6.3.
3. Define specific requirements for Chemistry instrumentation in 6.4.
4. Add Appendix 3, Minimum Required no. of Instruments (and/or method of analysis) for Critical Analysis.