L-Università ta' Malta

STANDARD OPERATING PROCEDURE

SOP CODE	SOP TITLE
MMB-001-01	**WATER QUALITY ANALYSIS FOR REVERSE OSMOSIS SYSTEM NOBEL MODEL RO221D**

PART 1

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PART 3

Authorizer	**Date of Issue:** **Date of next revision:**
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PART 4 (To be filled in by OOS, QSU or RSSD)

☐ This procedure has been revised and is no longer valid as from: (Write date)	☐ Date of NEXT REVISION is extended until: (Max. 4 years)	☐ SOP rendered obsolete on: (Write date)

1. Reason for revision

1.1. Not applicable. New SOP

2. Purpose and scope

2.1. The SOP is intended to describe the method of analysis using a portable pH/ conductivity portable meter to monitor the quality of water provided by the RO system Nobel RO221D installed in the Plant Room (Rm: 348b) at the Biomedical Sciences building and which provides laboratory grade water.

2.2. In order to maintain good quality water, it is necessary to ensure that tests are carried out regularly in a scheduled plan. Two categories of checks are made on the system:

- On-site water testing for pH and conductivity levels carried out in-house.
- Bacteriological and *Legionella* specific tests carried out by external accredited labs.

2.3. Within the scope of implementation of this SOP are all the technical personnel making use of this RO system.

3. Definitions

3.1. SOP – Standard Operating Procedure
3.2. µS– microSiemens (International unit of measure of Conductivity)
3.3. ppm: Parts per million
3.4. RO: Reverse Osmosis

4. Responsibilities

4.1. **Laboratory Staff**

4.1.1 It is the responsibility of the laboratory staff to ensure regular maintenance and testing of the reverse osmosis plant according to a pre-scheduled plan.

4.1.2 On site water testing is to be carried out daily ensuring that all testing equipment is calibrated at all times prior to use (weekly or whenever required).

4.2 **External sub-contracted lab**

4.2.1 An accredited laboratory (ClearFlow+ Co. Ltd., a subsidiary of Water Services Corporation) is responsible for the bacteriological and *Legionella* specific testing as per requirements stipulated in Legal Notice 17 of 2009, and Legal Notice 5 of 2006, respectively.

4.2.2 Water sampling for external bacteriological testing is carried out quarterly while that for *Legionella* testing is carried out biannually.

5. Health and Safety Requirements

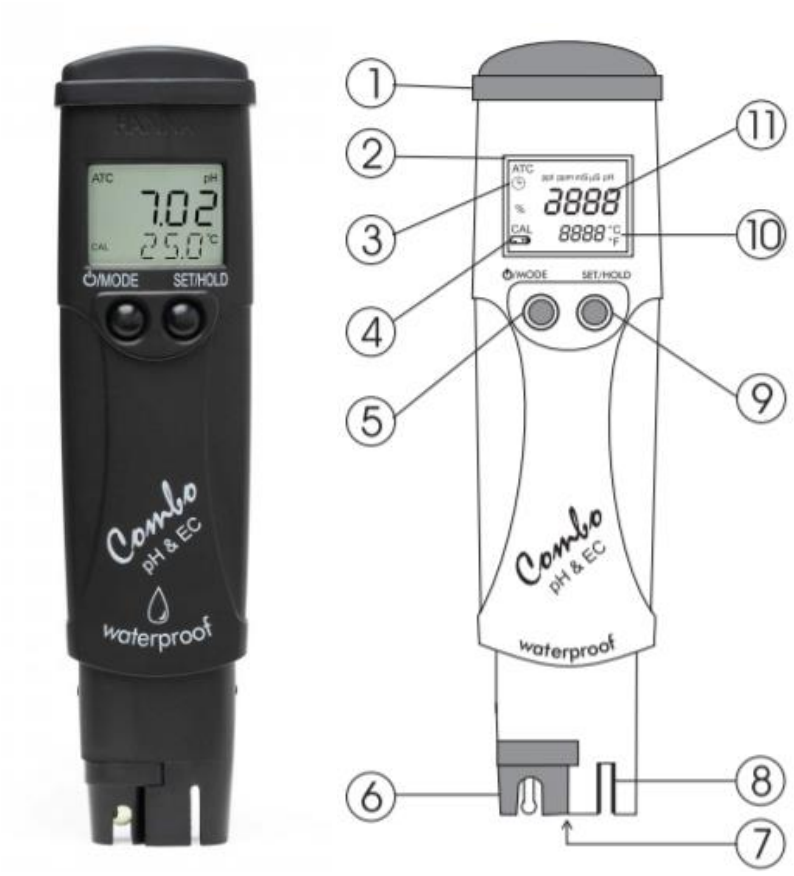
5.1. Suitable disposable gloves must be worn during the analysis of the reverse osmosis water system in order to prevent contamination of the system.

6. Procedure

The Reverse Osmosis plant system's technical specifications are as follows:

Parameter	Value
Brand	Nobel
Origin	Milano, Italy
Model	RO221D
Serial Number	43658
Year	2013
T Max	$40^{o}C$
P Max	600kPa
Mass	24kg
Volts	230
Kilowatt	0.37
Ph/Hz	1/50

On-site testing of water quality is carried out using a hand held portable pH/ Conductivity meter Hanna Model HI-98129.



1. Battery compartment
2. Liquid Crystal Display (LCD)
3. Stability Indicator
4. Low battery indicator
5. ON/OFF/ MODE button
6. HI 73127 pH electrode
7. Temperature sensor
8. EC/TDS probe
9. SET/HOLD button
10. Secondary LCD
11. Primary LCD

Fig 1 – pH / Conductivity meter Hanna HI-98129

6.1. **CALIBRATION of meter HI 98129 for pH and Conductivity**

6.1.1 A verification check on the performance of the meter is made at least once a week or potentially more frequently as deemed necessary, using the standard manufacturer's pH buffer and calibration solutions as a reference. In the event a drift in the readings is observed, the meter needs to be calibrated prior to recording the pH and conductivity of the actual water samples.

The pH is calibrated at **7.01** and the conductivity at **1413 µS/cm**.

6.1.2 All of the meter probes are to be stored in a storage buffer solution before use. This is to maintain a constant ion activity in the sensing part, to ensure accurate readings and a fast response time.

6.1.3 The temperature of the water is checked to identify set temperature for calibration.

6.1.4 Aliquots of separate conductivity and pH calibration buffers are allowed to reach the desired temperature in an orbital incubator.

6.1.5 The meter probe is rinsed with deionised water and gently dried to remove water droplets. Rubbing of the probes may interfere with readings.

6.1.6 Turn the meter ON by pressing and holding the **MODE** button for 2-3 seconds (Fig. 1). The **SET/HOLD** button can be used to alternate between the pH function, and the conductivity function in both µS/cm or ppm.

6.1.7 **Calibration of meter for pH (Single-point)**

- From measurement mode, press and hold the **MODE** button until **TEMP** and the current temperature unit are displayed on the lower LCD.
- Press the **MODE** button again to show the current buffer set: pH 7.01 BUFF or pH 6.86 BUFF.
- Press the **SET/HOLD** button to change the buffer value to 7.01.
- Press the **MODE** button to return to normal measuring mode.
- From measurement mode, press and hold the **MODE** button until **CAL** is displayed on the lower LCD. Release the button.
- The LCD will display pH 7.01 USE or pH 6.86 USE
- For a single-point pH calibration, place the electrode in any buffer from the selected buffer set (pH 7.01). The meter will recognize the buffer value automatically.
- After recognition of the buffer the meter will ask for pH 4.01 as second calibration point.
- Press the **SET/HOLD** button which will display **"OK 1"** and will return to measurement mode.

(Refer to Operator Manual if a 2-point calibration is desired)

6.1.8 **Calibration of meter for Conductivity (1413 µS/cm**)

- From measurement mode, press and hold the **MODE** button until **TEMP** and the current temperature unit are displayed on the lower LCD.
- Press the **MODE** button again to show the current conversion factor.
- Press the **SET/HOLD** button to change the conversion factor.
- Press the **MODE** button to show the current temperature compensation coefficient β.
- Press the **SET/HOLD** button to change the temperature compensation coefficient β. Press the **MODE** button to return to normal measuring mode.
- From measurement mode, press and hold the **MODE** button until **CAL** is displayed on the lower LCD.
- Release the button and immerse the probe in the proper calibration solution: HI7031 (1413 µS/cm)
- Once the calibration has been automatically performed, the LCD will display OK for 1 second and the meter will return to normal measurement mode.
- The **CAL** symbol on the LCD means that the meter is calibrated

6.2. **MEASUREMENT of pH and Conductivity using meter HI 98129**

6.2.1 The pH meter probe is rinsed with deionised water and gently dried to remove water droplets as above.

6.2.2 The meter is immersed in the water to measure pH and conductivity (in µS/cm). The **SET/HOLD** button is used to alternate between the pH measurement function and the conductivity function in both µS/cm or ppm. A log sheet as per Appendix 1, is kept for all daily readings, and the same log sheet on Google Drive is updated regularly.

6.2.3 The pH meter is rinsed with deionised water between measurements and after use. **IMPORTANT** : Store the meter in its appropriate buffer storage solution when not in use.

6.2.4 **Measurement of pH value**

- Select the pH mode with the **SET/HOLD** button.
- Submerge the electrode in the water sample to be tested.
- The measurements should be taken when the stability symbol on the top left of the LCD disappears.
- The pH value automatically compensated for temperature is shown on the primary LCD while the secondary LCD shows the temperature of the sample.

6.2.5 **Measurement of Conductivity**

- Select either EC or TDS mode with the SET/HOLD button.
- Submerge the probe in the solution to be tested. Use plastic beakers to minimize any electromagnetic interferences.
- The measurements should be taken when the stability symbol on the top left of the LCD disappears.
- The EC (or TDS) value automatically compensated for temperature is shown on the primary LCD while the secondary LCD shows the temperature of the sample.

6.3. **Water sampling for Bacteriological and Legionella Testing**

6.3.1 Water is sampled according to the procedure required by the accredited laboratory. Trained personnel are sent by the accredited laboratory to sample the water in sterile containers.

6.3.2 Sample points for **quarterly** bacteriology testing include:

1. Room 328: Reverse Osmosis tap
2. Room 348b: Tank 3
3. Room 348b: Tank 4
4. Room 403a: Reverse Osmosis tap

6.3.3 Sample points for **biannual** *Legionella* testing include:

1. Rooms 311/312: Mains water tap- Male/Female bathrooms
2. Room 328: Reverse Osmosis tap
3. Room 328: Mains water tap
4. Room 348b: Tank 3
5. Room 348b: Tank 4
6. Room 403a: Reverse Osmosis tap
7. Room 403a: Mains water tap
8. Rooms 406/407: Mains water tap- Male/Female bathrooms

7. References

7.1. *Legal Notice 17 of 2009 as amended by Legal Notice 242 of 2009; and Act XXV of 2015, and by Legal Notice 299 of 217* – Water Intended for Human Consumption Regulations.

7.2 *Legal Notice 5 of 2006 as amended by Legal Notice 262 of 2006* – Control of Legionella Regulations.

7.3 Instruction Manual HI98129 – HI98130: Waterproof pH, EC/TDS & temperature meters.

8. List of Appendices/Worksheets

8.1 Appendix 1: Calibration & Readings log sheet

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Appendix 1

Calibration & Readings log sheet

REVERSE OSMOSIS CHECK — **MONTH/YEAR:**

	VERIFICATION CHECK		CALIBRATION		TANK LEVEL				MEASUREMENT READING				CHECKED	COMMENTS
	pH	*Conductivity (µS/cm)*	*pH*	*Conductivity (µS/cm)*	*Water*		*Salt*		*pH*		*Conductivity (µS/cm)*			
	7.01	1413	7.01	1413					*(7.00-9.00)*		*(50 -100)*			
TANK No					3	4	3	4	3	4	3	4		
DATE														
1	☐	☐	☐	☐	☐	☐	☐	☐						
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JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC