Royal Hospital for Women (RHW)
NEONATAL BUSINESS RULE
COVER SHEET

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SUMMARY	The Sentec transcutaneous monitor (TCM) measures the carbon dioxide of a neonate via a sensor that is attached to the neonate's skin. This CBR aims to guide the clinician in the application and care of the Sentec device.
Key Words	Transcutaneous monitoring, Carbon Dioxide monitoring, TCM, Neonate, blood gas

Sentec Transcutaneous Monitoring Device- Application and Care (Neonate)

RHW CLIN091

Contents

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RHW CLIN091

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1 BACKGROUND

Correct application of the Sentec transcutaneous monitoring (TCM) device provides an accurate measurement of carbon dioxide levels, therefore reducing the frequency of invasive blood gas procedures.

2 RESPONSIBILITIES

2.1 Staff

2.1.1 Medical – requesting the use of Sentec TCM and analyse readings.

2.1.2 Nursing – Application, management and care of the device. Preserving neonate's skin integrity. Performing a blood gas as required and interpreting results.

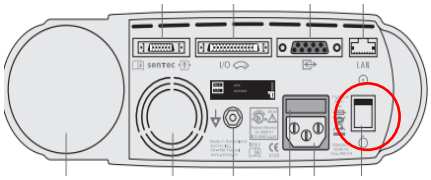
3 PROCEDURE

3.1 Equipment

- Sentec TCM Device (Picture 1)
- eRIC cables (Picture 2)
- Attachment rings or sensor membrane wrap (based on neonate's size)
- Contact gel/liquid
- Non-adhesive wrap
- Cotton wool ball
- Sterile water for injection
- Alcohol prep pads for sensor cleaning (70% Alcohol - Blue sachet)
- Membrane sensor changer (for re- membraning sensor)
- Sentec gas bottle (for changing gas bottle when empty)

Picture 1

Picture 2



Picture 3

3.2 Eligibility criteria

- Neonates who require continuous CO_2 monitoring
- Unstable clinical condition with significant respiratory illness and/or progressively fast changing respiratory disease
- Additional monitoring to target respiratory support
- Reduce frequency of blood gases being performed

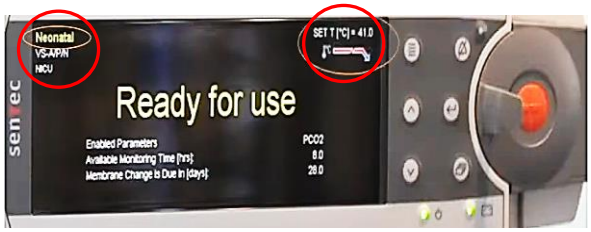
NOTE
Inaccurate $C0_2$ monitoring may be seen in neonates experiencing:
- Whole Body Cooling Therapy
- Poor perfusion and/or poor skin integrity (eg. from sepsis)
- Inotropic support (may have false $tcPCO_2$ readings)

DO NOT USE SENTECT TCM ON THESE PATIENTS

3.3 Clinical Practice

3.3.1 Monitor Settings

- Plug monitor power cord into electrical power point at bedspace and switch on.
- Connect the eRIC Device Identification Module (DIM) cable labelled “SENTEC” to the back of the TCM device (Picture 2)
- Switch on the black power switch button at the back of the monitor (Picture 3)
- Display screen should read: “Ready for use”
- Check the monitor is set for “Neonatal” use (Picture 4)
- Ensure sensor temperature setting and sensor site times are set as Table 1 (Picture 4)
- Press Menu button ( ) to access Alarm settings (Picture 5)
- Press arrow button ( ) to confirm alarm settings
- Ensure alarm settings are: upper $tcPCO_2$ - 70mmHg
  lower $tcPCO_2$ - 35mmHg

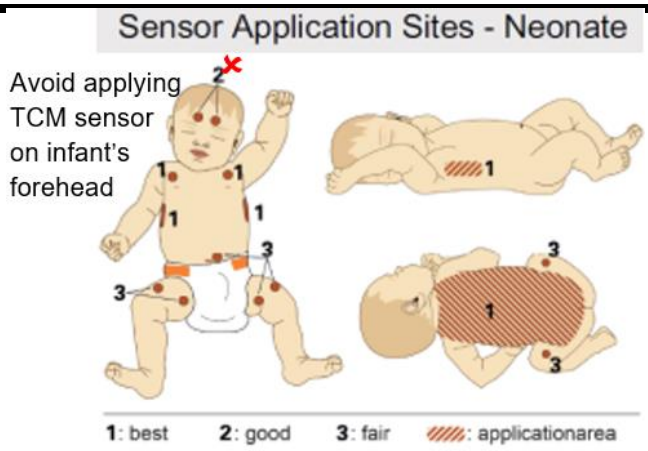


Picture 4

Picture 5

Table 1

SENSOR TEMPERATURE SETTING	SENSOR SITE TIME
41°c	4 hours
Consideration and caution when using TCM on an extreme preterm (<30 weeks). If a neonate has compromised skin integrity, use 41°C temperature for 2 hour site time.	



Picture 6

Note: (See Picture 6)

- Avoid the following sensor sites:
  - The nipple areas at all times
  - Previous sensor sites
- Avoid sensor application site on the neonates forehead to prevent risk of scarring from a TCM sensor burn
- Avoid positioning the neonate to be lying on the sensor ring or TCM cable to prevent pressure injury

3.2.2 MAR and Non- Adhesive Wrap Application

- Choose an appropriate Multi-site Attachment Ring (MAR) for neonate
  - MAR-Mature/Intact skin (MAR- MI)– standard ring for mature/intact skin (micropore/paper-based adhesion) (Picture 7)
  - MAR- Sensitive/ Fragile skin (MAR- SF) – ring for sensitive/fragile skin (silicon-based adhesion) (Picture 8)
  - Non-adhesive wrap – for neonates in high humidity environment, extreme premature neonates, neonates with fragile skin (Picture 9)

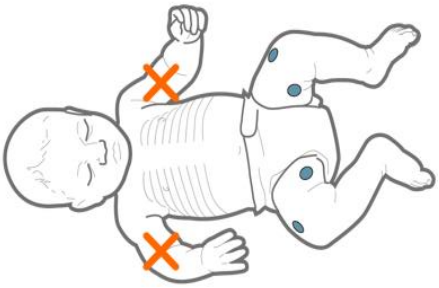
Picture 7

Picture 8

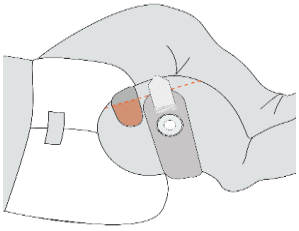
Picture 9

- Choose a measurement site for non- adhesive wrap application (Picture 10)
  - Consider the neonate's position in bed
  - Ensure the neonate will not be lying on the sensor
- Measure wrap around the upper thigh (Picture 11)
- Cut wrap to ensure that the 2 ends do not overlap (Picture 12)
  - A "nose-to-nose" fit to prevent exposing the neonate's skin to velcro (Picture 13)
  - Make the first cut a little longer to allow for trimming (if required)

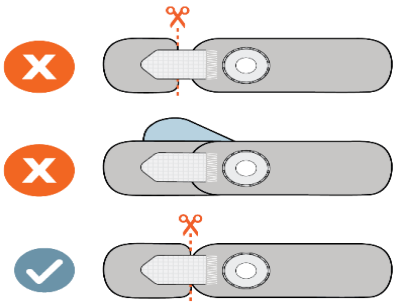
- Ensure a gentle but secure application of the wrap (Picture 13)
  - Avoid over-tightening the wrap – this can cause decreased local perfusion and a falsely high tcPCO2 value
- For MAR or Non- Adhesive wrap application:
  - Clean the skin with cotton wool ball and sterile water
  - Allow skin to dry before attaching the MAR or wrap
  - Attach MAR/ wrap to the cleaned skin (Picture 11, 14)
  - Ensure the skin is smooth under the MAR/ wrap – re-apply if wrinkled
  - Apply one drop of contact gel/liquid to skin area in the centre of the fixation ring (Picture 15)



Picture 10



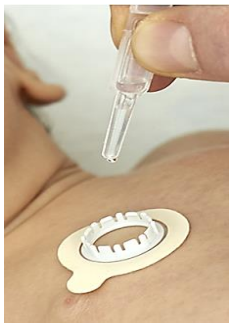
Picture 11



Picture 12

Picture 13

Picture 14



Picture 15

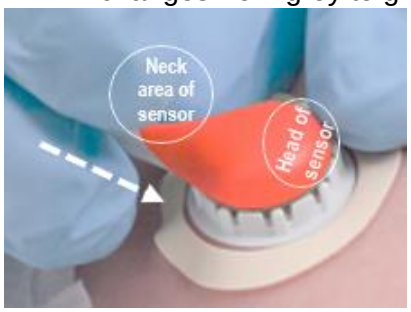
Note:
Frequently assess:-

- The fit of the wrap
- A change in the patient's condition can cause the fit of the wrap to tighten causing decreased local perfusion and impact tcPCO2 correlation
- Check the wrap for "nose-to-nose" fit at each site change to ensure the thigh circumference has not changed due to oedema

3.2.3 Sensor application

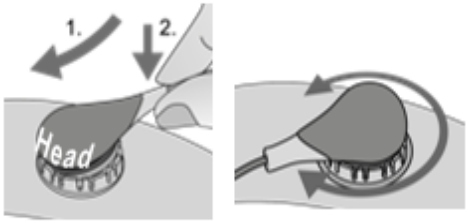
- Remove sensor from docking station when the monitor displays "Ready for use".
- Hold sensor at the neck area of cable (Picture 16)
- Check that there are no air gaps between the membrane (Picture 17) – re-membrane if required.

- Insert sensor into the MAR/ wrap at an angle with head of sensor down into MAR/ wrap (Picture 18)
- Apply slight downward pressure and rotate in the MAR/ wrap to spread contact gel and to ensure the sensor can be easily rotated
- $tcPCO_2$ readings typically stabilise within 2 – 10 minutes and the display value changes from grey to green



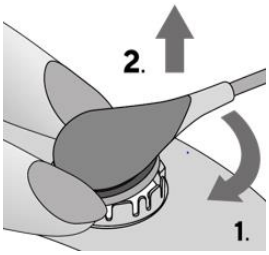
Picture 16

Picture 17



Picture 18

- Ensure sensor has full contact with the skin for an accurate measurement reading
- Re-site of sensor
  - Remove sensor after set site time elapse (Picture 19)
  - Clean sensor with the 70% alcohol wipe (Picture 20)
  - Place sensor in the docking station to calibrate (Picture 21)



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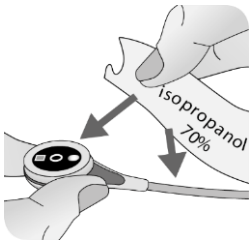
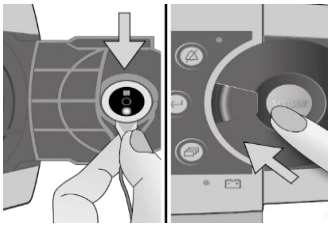


Picture 20



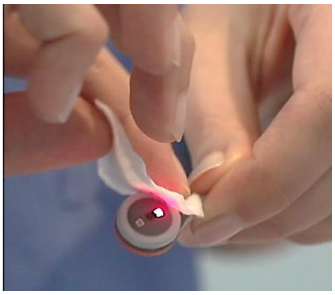
Picture 21

- Remove sensor from docking station when monitor displays “Ready for use”
- Remove wrap from current site when:
  - Site time has elapsed
  - Apply the wrap to opposite leg of current site
  - Wrap may be used on one patient for up to 24 hours – discard thereafter
  - Replace wrap if visibly soiled or the velcro no longer attaches securely
- Re-apply wrap to the opposite leg following the instructions set out in Non-Adhesive Sensor Wrap
- Remove sensor from current site MAR site when:
  - Site time has elapsed
  - Rotate MAR sites 4 hourly with sensor changes
  - MAR is visibily soiled or it is lifting from the patient’s skin

3.2.4 Changing the TCM site:

- Sensor timer is pre set to 4 hours (Table 1).
- A low priority alarm sounds with the displayed message on the status bar: “Site Time Elapse” with the “remaining Monitoring Time” icon displaying in red.
- Apply a second MAR/ wrap to the neonate as per “Sensor Application – Action No. 3”.
- Apply contact gel to the new MAR/ wrap site prior to removing the sensor off the current site
- Inspect the neonate’s skin at the MAR/ wrap site after removing sensor.

> Note:
> Inspect the neonate’s skin after removal of MAR/ wrap for:
> - State of skin integrity
> - Skin redness
> - Potential skin burn
> - **DO NOT** use an alcohol swab on the neonate’s skin



Picture 22

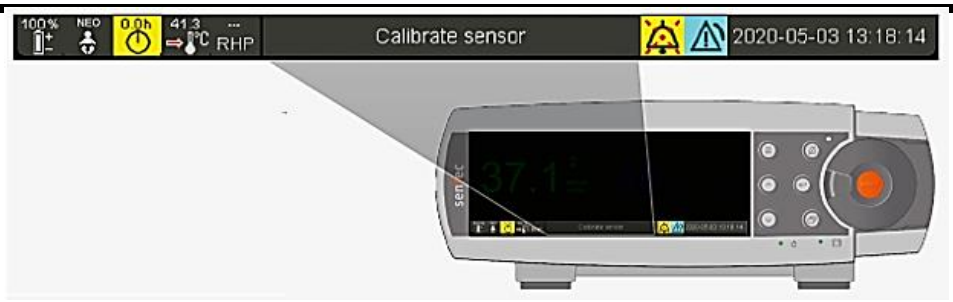
Picture 23

Picture 24

- Wipe the sensor clean with alcohol swab (Picture 22)
- Check the condition of the membrane and integrity of sensor beore/after use before inserting into Docking Station (calibration is automatic) (Picture 23)

3.2.5 Sensor calibration and storage

- Once sensor has been re-docked the monitor screen will display “Calibration in Progress”
- When calibration is complete, monitor screen will display ”Ready for use” (Picture 24)
- Calibration is required:
  - After 12 hours of use
  - When sensor is disconnected for more than 30 minutes
  - Sensor has been dislodged for more than 5 minutes
  - Monitor displays the message “Calibrate sensor” (Picture 25)
  - The sensor membrane is changed
  - The sensor temperature is changed
  - The accuracy of the TCM measurement is in doubt
  - The monitoring site is changed



Picture 25

Note:
Care of the sensor when it is off the neonate:

- Never leave sensor on neonate's bed
- Always place the sensor in docking station of monitor when not in use

3.2.6 Replace the sensor membrane when

- The monitor displays the message: "Change sensor membrane".
- Marks pCO_2 values as invalid ('---').
- The sensor membrane is damaged, missing or has a loose fit.
- Evidence of trapped air under the membrane or membrane is dry.

3.2.7 Changing sensor membrane

- This is a 4-step process: press, release and then turn action
- Ensure the sensor is cleaned with 70% alcohol swab before changing the membrane to loosen dried-up contact gel.
- Peel off the liner on the back of sensor membrane changer block (Picture 26) before placing on work-surface. (Picture 27)
- Insert sensor membrane side facing up into receiver. (Picture 28)

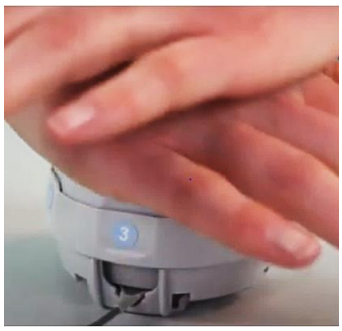
Picture 26

Picture 27

Picture 28

Picture 29

Picture 30



Picture 31

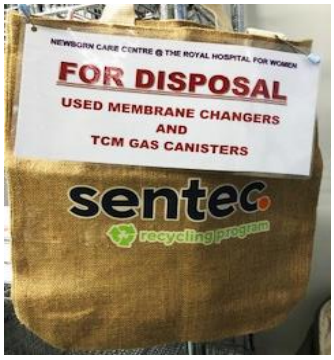
- Step 1: Removes the old sensor membrane.
  - Press down sensor receiver firmly and hold for 3 second (Picture 29)
  - An audible “click” occurs
  - Slowly release sensor receiver (this removes the old membrane)
  - Visually confirm the membrane removal
- Step 2: This cleans sensor from old electrolytes.
  - Turn lower section of the membrane changer clockwise to number 2
  - Press down sensor receiver firmly and hold for 3 second (Picture 30)
  - An audible “click” occurs
  - Slowly release the sensor receiver
- Step 3: Applies new electrolyte to the sensor surface.
  - Repeat process
  - Turn lower section of membrane changer clockwise to number 3
  - Press down sensor receiver firmly and hold for 3 second (Picture 31)
  - An audible “click” occur
- Step 4: Applies a new membrane.
  - Hold lower chamber of sensor receiver and turn the membrane changer with numbers one click clockwise to number 4
  - Press down completely (this enables the new membrane to snap into position
- Release the sensor probe.
  - Turn lower chamber of membrane changer with numbers to the tick ( )
  - Press until it clicks to release the sensor probe
  - Remove the sensor from chamber (Picture 32)
  - Check that there are no air bubbles under membrane (Picture 33)
  - Ensure that the membrane is correctly seated on sensor

3.2.8 Membrane Changer Disposal

- Always dispose the membrane changer after each membrane change
- Put the used membrane changer into the labelled re-cycling bag (Picture 34) that is hanging next to the TCM storage shelf in the monitor storeroom
- Collection and disposal service is provided by the SenTec Company Territory Sales Manager.

Picture 32

Picture 33



Picture 34

3.2.9 Confirm the membrane change on the TCM

- Open docking station door (Picture 35)
- Sit probe in the docking station door (Picture 35)
- On monitor: press “Menu button” -
  - Press “Enter Button” - to open “Quick Access Menu”
  - Press arrow to select “Membrane Change Done” on displayed menu
  - Close docking station
  - Select to “Calibrate Sensor”

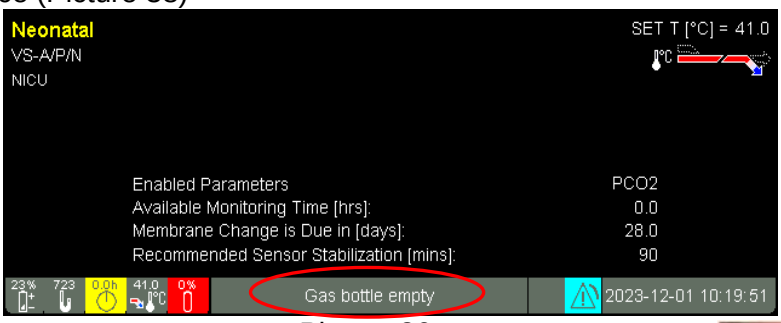
Picture 35

3.2.10 Changing alarm limits on the monitor

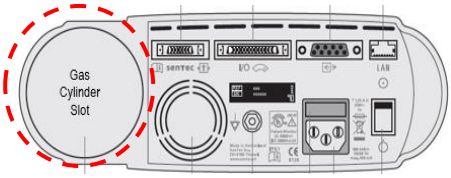
- Display screen should read: “Ready for use”
- Changing of alarm limits may be done while sensor is on the neonate during monitoring
- Press menu button ( )
- Select alarm settings
- Press enter button ( )
- Use arrow key buttons ( ) to change pCO_2 high or low limit setting
- Press enter button ( ) to register value
- Press display button ( ) to return to monitoring screen

3.2.11 Replacing an empty gas canister

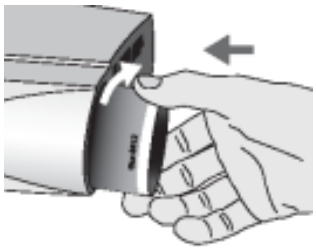
- Change the empty gas canister when the monitor displays: “Gas bottle empty” (Picture 36) and a low priority alarm will sound
- Remove the empty gas cylinder in the gas cylinder slot at the back of monitor (Picture 37)
  - Turn the gas bottle counter –clockwise (approx. 4.5 turns – “Left to loosen”)
- Insert the new gas cylinder into the gas cylinder slot at the back of monitor
  - Turn the gas-cylinder clockwise (approx. 4.5 turns – “right to tighten”) without force (Picture 38)



Picture 36



Picture 37



Picture 38

Picture 39

- Discharge any residual gas in the gas canister (aluminium container):
  - Ensure the procedure is done in a well ventilated area
  - Depress the metal nozzle (red) in the canister to discharge any residual gas (Picture 39)
  - A soft whistling noise will occur confirming that the gas can is empty
- Dispose gas canister in the labelled “recycling” bag (Picture 34) that is parked next to the TCM storage shelf in monitor storeroom
- Collection and disposal service is provided by the SenTec Company Territory Sales Manager

Note:
- Status icon “Gas” displayed indicates the remaining capacity of the gas canister in %
- Icon is displayed if the sensor is connected to the monitor and in the docking station
- Do not change the gas canister during sensor calibration
- Do not use expired gas canisters from manufacturers other than SenTec
- Do not expose the gas canister to high heat(<50 °C (122 °F), pierce or burn it
- Dispose sensor membrane changer block and the empty gas canister in the hessian bag next to TCM storage shelf in monitor storeroom. Both these items can explode if they are discarded in an incinerator

3.3 Documentation

- eRIC

3.4 Education Notes

- Transcutaneous monitoring reflects changes in the circulatory and peripheral status of the neonate e.g. when the neonate is cold or in shock which can lower peripheral circulation
- TCM provides a trend that reflects an acceptable target range of $tcPCO_2$ while minimising blood sampling for blood gases

3.5 Abbreviations

TCM	Transcutaneous Monitoring	CO_2	Carbon Dioxide
$tcPCO_2$	Transcutaneous Partial Carbon Dioxide	MAR	Multi-site Attachment Ring
MAR-MI	Multi-site Attachment Ring – Mature/Intact Skin	MAR-SF	Multi-site Attachment Ring – Sensitive/Fragile Skin
pCO_2	Partial Carbon Dioxide		

3.6 CBR Implementation Plan

The revised CBR will be distributed to all medical, nursing and midwifery staff via @health email. The CBR will be discussed at ward meetings, education and patient quality and safety meetings. Education will occur through in-services, open forum and local ward implementation strategies to address changes to practice. The staff are asked to respond to an email or sign an audit sheet in their clinical area to acknowledge they have read and understood the revised CBR. The CBR will be uploaded to the CBR tab on the intranet and staff are informed how to access

3.7 Related Policies/procedures

- RHW NCC Medical CBR - Surgery at the bedside - Perioperative Guidelines
- RHW NCC Nursing CBR – Heel Prick for Blood Sampling
- RHW NCC Nursing CBR - Extubation

3.8 References

- Baumann P, Gottac V, Adzikaha S, Berneta V. Accuracy of Novel Transcutaneous pCO2 and pO2 sensor with opticalpO2 measurement in neonatal intensive Care: A - centred Prospective Clinical Trial. Neonatology, 2022, 231-237.

- Hochwald O, Borenstein-Levin L, Dinur G, Jubran H, Ben-David S, Kugelman A. Continuous Noninvasive Carbon Dioxide Monitoring in Neonates: From Theory to Standard of Care. Pediatrics. 2019,14491:20183640
- SenTec Transcutaneous Monitoring System Instruction Manual: https://www.sentec.com/products/sentec-transcutaneous-monitoring-system/

4 ABORIGINAL HEALTH IMPACT STATEMENT DOCUMENTATION

- Considerations for culturally safe and appropriate care provision have been made in the development of this Business Rule and will be accounted for in its implementation.
- When clinical risks are identified for an Aboriginal and/or Torres Strait Islander woman or family, they may require additional supports. This may include Aboriginal health professionals such as Aboriginal liaison officers, health workers or other culturally specific services

5 CULTURAL SUPPORT

- For a Culturally and Linguistically Diverse CALD woman, notify the nominated cross-cultural health worker during Monday to Friday business hours
- If the woman is from a non-English speaking background, call the interpreter service: NSW Ministry of Health Policy Directive PD2017 044-Interpreters Standard Procedures for Working with Health Care Interpreters.

6 NATIONAL STANDARDS

- Standard 1 Clinical Governance
- Standard 5 Comprehensive Care
- Standard 6 Communicating for Safety
- Standard 8 Recognising and Responding to Acute Deterioration

7 REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
2nd July 2024	1	KB Lindrea (CNC), K Lintott (Senior Territory Sales Manager Sentec Devices)
29.8.24	1	Endorsed by NCC CBR Committee
9.9.24		Endorsed RHW BRGC