

Sentec Digital Monitor: Competency Checklist



This form is a self-assessment tool. The practitioner should be able to discuss the rationale for each of the actions and demonstrate competency in the practical applications of these skills as applicable.

Full Name:	Date:
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Department:

Medical Device: Sentec Digital Monitor with V-Sign Sensor

Competencies Required:

	Bedside Clinician	<input type="checkbox"/>
	Correlation Experts "Superusers"	<input type="checkbox"/>
	Maintenance & Troubleshooting Expert	<input type="checkbox"/>

Bedside Clinician: Manage the training and implementation of how to apply the sensor and rings, appropriate site time and sensor temperature, sensor calibration, and how to manage the sensor during disconnection for kangaroo care and bed changes.

- | | Achieved |
|---------------------------------------------------------------------------------------------------------|--------------------------|
| 1. Identify the clinical indications for using transcutaneous monitoring | <input type="checkbox"/> |
| 2. Demonstrate or describe how to switch on the monitor..... | <input type="checkbox"/> |
| 3. Describe the function of each control button: | <input type="checkbox"/> |
| 4. Name the approved measurement sites for neonatal patients | <input type="checkbox"/> |
| 5. Define the recommended site time and sensor temperature for PCO ₂ monitoring..... | <input type="checkbox"/> |
| 6. Describe what a good quality sensor looks like and what problems to look out for..... | <input type="checkbox"/> |
| 7. Explain how to verify that the monitor is ready to use for patient monitoring | <input type="checkbox"/> |
| 8. Demonstrate or describe the process for sensor application | <input type="checkbox"/> |
| 9. Explain how to determine if the transcutaneous value is stabilized after application..... | <input type="checkbox"/> |
| 10. Explain how you can easily troubleshoot a high or low tcPCO ₂ value at the bedside | <input type="checkbox"/> |
| 11. Explain the steps to clean and calibrate the sensor after site time elapses | <input type="checkbox"/> |
| 12. Name the icons relevant to patient monitoring that can be seen in the Status Bar | <input type="checkbox"/> |

Correlation Experts “Superusers”: In addition to the Bedside Clinician Competencies, these users understand the relationship between perfusion and the correlation of tcPCO₂ readings to blood gases. They know what can impact the reading and how to troubleshoot values that are not correlating.

- Achieved**
- 13. Explain some of the main factors that can affect the tcPCO₂ reading
 - 14. When should you record the tcPCO₂ value when comparing the value to an ABG?
 - 15. What can cause tcPCO₂ values that are higher than the ABG? What can you do to resolve the issue?
 - 16. What can cause tcPCO₂ values that are lower than the ABG? What can you do to resolve the issue?
 - 17. What are the 5 S’s you can check for if you are troubleshooting poor correlation between the transcutaneous CO₂ value and blood gas?
 - 18. Explain the following low-priority alarms or issues and how to fix them:
 - Connect sensor
 - Sensor off patient
 - Values not stabilizing after sensor application.
 - 19. Name the common error messages and where to locate troubleshooting resources
 - 20. Explain how the monitor and sensor are to be stored between uses
 - 21. Explain how to set a baseline on the monitor and scenarios where a baseline may be helpful.
 - 22. Explain the concept of RHP and how it can help when troubleshooting poor correlation or a sudden change in tcPCO₂.

Maintenance & Troubleshooting Experts These users are responsible for keeping the Sentec Digital Monitoring System running smoothly, including cleaning procedures, membrane changes, and troubleshooting simple error messages.

- Achieved**
- 23. Explain or demonstrate how to identify the remaining capacity of the Calibration Gas Cylinder in %
 - 24. How long is the membrane change interval?
 - 25. Where on the monitor can you see the membrane change lifetime?
 - 26. Demonstrate or describe how to re-membrane the sensor.
 - 27. Describe how to confirm the membrane change on the monitor
 - 28. Explain how to troubleshoot these error messages and where to find troubleshooting resources:
 - Sensor Problem 11
 - Sensor Problem 12
 - Gas Leak in Docking Station
 - 29. Identify the recommended cleaning product to use after every patient monitoring session.
 - 30. Describe when and how to complete a sensitivity test.
 - 31. Describe when and how to complete a clean and soak of the Sentec sensor

Clinician Signature _____ **Date** _____

Trainer Signature _____ **Date** _____

Sentec Digital Monitor: Competency Checklist Key

Bedside Clinicians

1. Clinical Indications

For continuous, non-invasive monitoring of carbon dioxide tension.

2. Power On

The ON/OFF Switch is located on the back of the monitor next to the main power connector.

3. Control Panel

-  Menu/Previous Level
-  Down Button: Navigate menus, decrease values and brightness
-  UP Button: Navigate menus, increase values and brightness
-  Alarm pause/Audio OFF
-  Enter Button: Activate quick access menu; silences sensor off patient alarm
-  Display Button: Switch between displays

4. Measurement Sites

Neonatal: forehead, upper chest, abdomen and flanks, upper thighs, and back.

Adult: PCO₂/SpO₂/PR: forehead, cheek, earlobe, upper arm, shoulder blade; PCO₂ only: beneath the clavicle, lower arm

5. Site Time and Temperature

Neonatal patients (younger than term birth + 12 months): 41°C for up to 8 hours.

Adult/pediatric patients (older than term birth + 12 months): 42°C for 8 hours

6. Sensor Inspection

A good quality sensor has a smooth membrane surface, functioning red LED, and an intact sensor cable. Do not use the sensor if the membrane has a dried-out appearance, air bubbles under the membrane, or if the center ring appears silver.

7. Ready for Use

Before initiating patient monitoring, ensure the current SDM Settings/SDM Profile are appropriate for the patient, for the selected measurement site, for the skin condition/ skin tissue perfusion at the selected measurement site, and for the specific clinical setting. At a minimum, check the patient type, enabled parameters, sensor temperature, 'Site Time' and alarm specific settings.

Verify system readiness (message 'Ready for use') and check the 'Available Monitoring Time' to ensure you have enough monitoring time.

8. Sensor Application

1. The Sentec screen must display 'Ready for Use.'
2. Clean patient skin site and allow to dry. Apply the Multi-Site Attachment Ring to the measurement site, gently pressing around the ring to ensure good adhesion to the skin. Verify that the skin under the adhesive is not wrinkled.

3. Remove the sensor from the Docking Station and close the Docking Station door.

4. Apply 1-2 small drops of Contact Gel to the skin in the center of the ring or onto the sensor surface.

5. Holding the sensor by the neck, (1) insert the sensor nose-first into the ring and (2) press gently downward on the neck until it clicks into place. Rotate the sensor within the ring to distribute the Contact Gel.

6. Tape the sensor cable in place if desired and ensure that there will be no tension on the cable during monitoring. Do not tape over the sensor.

9. Stabilization

TC readings typically stabilize within 2-10 minutes after sensor application. Once stabilized, the TC reading will turn from grey to green (default color).

10. Troubleshooting tcPCO₂ Values

If the tcPCO₂ reading is higher than expected, check the measurement site. External pressure on the sensor from the patient's position, bedding, dressings, medical devices, or diapers can decrease blood flow at the measurement site and cause higher tcPCO₂ values.

If the tcPCO₂ reading is lower than expected, check the sensor application. Air between the sensor and the skin caused by a loose sensor attachment, loose application ring, or lack of Contact Gel can cause lower tcPCO₂ values.

11. Sensor Cleaning and Calibration

Once the site time elapses, remove the sensor, and inspect the skin. Gently clean the sensor face and outer rim with 70% isopropanol. Do not scrub or apply force when cleaning the sensor surface. Hang the sensor in the Docking Station door with the red light facing out and close the Docking Station door. The SDM will check the sensor and – if necessary – start the sensor calibration (message 'Calibration in progress'). The message 'Ready for use' will display once calibration is complete.

12. Status Bar

1. The Battery Icon on the left indicates the remaining battery capacity in %.
2. On menu/measurement screens, you can view the patient type ('AD' in Adult mode or 'NEO' in Neonatal mode).
3. The remaining monitoring time icon indicates the 'Remaining Monitoring Time' on measurement/menu screens and the 'Available Monitoring Time' on the Calibration Screen. The Icon highlights red whenever the 'Site Time' has elapsed.
4. The 'Sensor Temperature' icon indicates the measured sensor temperature.
5. The 'Gas Icon' on the calibration screen indicates the remaining capacity of the Service Gas Bottle in %.
6. The Status Text field in the middle displays Status Messages (alarm/information messages).
7. The Audio Status Icon indicates the status of the SDM's auditory alarm signals (ON, PAUSED, OFF).

Correlation Experts “Superusers”

13. Limitations

The tcPCO_2 reading can be affected by the following: hypo-perfused skin beneath the sensor site due to shock, hypothermia, or use of vasoactive drugs; inadequate measurement site; Improper sensor application resulting in an inadequate, not hermetically sealed contact between the sensor surface and the patient’s skin (ex. no Contact Gel).

14. ABG Comparison

Blood sampling should be performed in steady state conditions. The $\text{PaCO}_2/\text{PaO}_2$ value obtained from ABG analysis should be compared to the SDM’s PCO_2/PO_2 reading at the time of blood sampling.

15. tcPCO_2 values > ABG

- Low perfusion at the measurement site.
- Sensor applied to a measurement site that is inadequate or not recommended for PCO_2 monitoring.
- The sensor has not had enough time to stabilize before patient monitoring. After turning on the monitor or changing the sensor membrane, it is recommended to store the sensor in the Docking Station with the monitor on for the duration indicated by the message “Recommended Sensor Stabilization [min]” on the Ready for Use screen.
- Technical issues, such as expired calibration gas, undetected gas leak in the Docking Station, or an aging sensor.

16. tcPCO_2 values < ABG

- Air between the sensor and the skin, either from a loose attachment or too little/no Contact Gel. Verify that the sensor is securely attached and ensure that air gaps are eliminated between the skin and the sensor. If needed, reapply the sensor (on same or an alternate site).
- Sensor applied to a measurement site that is inadequate or not recommended for PCO_2 monitoring. Apply the sensor to a recommended measurement site with an appropriate Sensor Attachment Accessory.
- The sensor has not had enough time to stabilize before patient monitoring. After turning on the monitor or changing the sensor membrane, it is recommended to store the sensor in the Docking Station with the monitor on for the duration indicated by the message “Recommended Sensor Stabilization [min]” on the Ready for Use screen.
- Technical issues, such as expired calibration gas, undetected gas leak in the Docking Station, or an aging sensor.

17. The 5 S's

Sample: Sample: Be sure to record TCM value at the time the blood sample is being collected. In patients with shunts, ensure that the sensor and the sampling site are both pre or post ductal. Pay attention to proper blood gas collection procedure.

Sensor: Ensure the sensor is set to the recommended temperature. Consider the age and condition of the sensor membrane.

Site: Check for external pressure on the sensor and the perfusion at the measurement site. If necessary, move the sensor to a more central site.

Seal: Always use 1-2 drops of Contact Gel during application and rotate the sensor within the ring to ensure good attachment.

Status: certain patient conditions, such as edema, vasoactive drug therapy, sepsis, and shunting can affect the local perfusion and impact the tcPCO_2 measurement.

18. Low-priority Alarms

Connect Sensor: Check to make sure the sensor adapter cable is plugged into the back of the monitor and the adapter cable is connected to the sensor. To identify the defective part, exchange the sensor adapter cable or the Sentec Sensor and try again.

Sensor off Patient: Check the sensor application. The sensor may be loosely attached to the patient, Contact Gel was not used during sensor application, or the monitoring site has poor perfusion.

Values not stabilizing: The sensor may be loosely attached to the patient with air between the sensor and the skin or no contact liquid. Verify that the sensor is securely attached and reapply the sensor on the same site if needed. Ensure that the sensor is applied to a recommended monitoring site.

19. Common Error Messages

Three common error messages are Sensor Problem 11 (SP11), Sensor Problem 12 (SP12), and Gas Leak in Docking Station (DS). Troubleshooting videos can be found on our Product Support Page with step-by-step instructions to help you clear the error.

20. Monitor and Sensor Storage

The sensor should always be stored in the Docking Station of the monitor. During frequent use, the monitor should remain switched on and connected to power.

21. Setting a Baseline

During patient monitoring, a baseline can be set by using the respective function in the Quick Access Menu (press Enter). The time the baseline was set and the baseline itself are displayed graphically on the monitor.

To assess the possible impact of a change in patient treatment (ex. changing ventilator settings, administration of medications, etc.) on the patient’s ventilation, it is recommended to set a baseline just before the change.

22. Relative Heating Power (RHP)

RHP is the electrical power needed to heat a sensor applied to the skin and maintain the constant temperature. As blood flow (and its associated cooling effect) increases, the sensor requires more power to maintain the selected sensor temperature and, therefore, the heating power increases. Conversely, as blood flow decreases, the sensor heating power decreases.

Once the sensor is stabilized on the skin, fluctuations of the heating power at constant ambient temperature may indicate changes in local skin blood flow. For example, if the tcPCO_2 rises while the heating power decreases, this may indicate that something has affected the perfusion at the measurement site and the clinician should check the site for any external pressure applied to the sensor.

Maintenance & Troubleshooting Experts

23. Calibration Gas Status

When the Sentec sensor is in the Docking Station, the SDM measures and displays the remaining capacity in the 'Gas Icon'. The 'Gas Icon' is highlighted yellow if the remaining capacity is <10% and red if the gas bottle is empty.

24. Membrane Change Interval

The membrane of a Sentec TC Sensor must be changed when the 'Membrane Change Interval' elapses (every 28 days) or sooner if the membrane is damaged or missing, has a loose fit, or if there is trapped air or dry electrolyte under the membrane.

25. Membrane Change Timer

The remaining time until the next membrane change is required is indicated by the yellow information message 'Membrane Change is Due in [days]' on the 'Ready for use' and 'Calibration' screens, as well as in the menu 'Membrane Change.'

26. Changing the Sensor Membrane

Keep the Membrane Changer horizontal while executing the four pressing and turning steps.

Step 1 removes the old sensor membrane: Press down slowly but firmly with palm of hand and hold for 3 seconds. Release the top. Carry out a visual check to ensure that the membrane is removed. Turn the top portion one click clockwise to the next step. Keep the Membrane Changer horizontal.

Step 2 cleans the sensor surface from old electrolyte: As in step 1, press the Membrane Changer slowly but firmly, release the top and turn clockwise to the next step.

Step 3 applies new electrolyte on the sensor surface: Press the Membrane Changer slowly but firmly for 3 seconds, release the top and turn clockwise to the next step.

Step 4 places a new membrane on the sensor: Press the Membrane Changer top down slowly but firmly for 3 seconds, release the top and turn clockwise to the √ symbol.

Press one last time or lift the sensor and remove it from the Membrane Changer. The √ symbol indicates that the membrane change is completed. Check the condition of the sensor membrane and the integrity of the sensor.

27. Confirming the Membrane Change

1. Insert the sensor into the Docking Station door and leave the door open.
2. Enter the menu and choose 'Membrane Change' then 'Membrane Change Done'.
3. Close the Docking Station door. Sensor calibration will begin automatically and the 'Membrane Change Interval' will reset back to 28 days.

28. Troubleshooting Common Error Messages

SP11: Check the sensor's center ring. If the ring is brown and intact (not white or silver), remove the membrane and perform a clean and soak. After gently drying the sensor, apply a new membrane. Confirm the membrane change on the monitor and allow the sensor to calibrate. If the SP11 Error persists, contact qualified service personnel.

SP12: Check the sensor's center ring. If the ring is brown and intact (not white or silver), remove the membrane and perform a clean and soak. After gently drying the sensor, apply a new membrane. Confirm the membrane change on the monitor. In this case, interrupt the Calibration to perform a Sensitivity Test. The sensor must pass the Sensitivity Test to clear the SP12 Error. If the SP12 Error persists, contact qualified service personnel.

qualified service personnel.

Gas Leak in DS: Verify that the sensor is clean and properly placed into the holder at the inside of the Docking Station (DS) door. If the Gas Leak continues after calibration, check the gasket of the DS. Clean the DS gasket with 70% isopropanol. If the gasket is missing or defective, replace the gasket and calibrate the sensor. If the Gas Leak persists, contact qualified service personnel.

29. Sensor Cleaning

The sensor face, housing, and cable should be cleaned after each monitoring session with 70% isopropanol or other approved cleaning agent. The sensor should always be stored in the Docking Station. The monitor should be cleaned weekly with a wipe soaked with 70% isopropanol. However, other cleaning/disinfection procedures may be applied per institutional ordinances.

30. Sensitivity Test

The sensitivity test should be completed monthly.

NOTE: If using software version 8.05 or higher, the Sensitivity Test can be found in the Quick Access Menu. Press enter, then select Sensitivity Test.

1. Insert the sensor into the Docking Station.
2. Use the menu function 'Measurement Settings/PCO₂ Settings/Sensitivity Test.' The Status Message 'Open DS door' displays, accompanied by two beeps.
3. Open the Docking Station door to expose the sensor to ambient air.
4. After 2 minutes, the Status Message 'Insert sensor into DS' and the 'Insert in DS' - pictures appears, insert the sensor into the Docking Station within 10 minutes.
5. Once the sensor is placed in the Docking Station, the sensor will automatically calibrate. In the Status Bar the Status Message 'Sensitivity Test' is displayed, while 'Calibration in progress' is displayed on the screen.
6. After sensor calibration, a leak test of the Docking Station is automatically performed. In the Status Bar the Status Message 'Sensitivity Test' is displayed, while 'Leak test in progress' is displayed on the screen.

If the 'Sensitivity Test' passed, the Status Message 'Ready for use' appears.

31. Clean and Soak

The clean and soak should be completed quarterly (every three months).

1. Remove the sensor membrane using the membrane remover on the bottom of the Membrane Changer.
2. Immerse the sensor into clean, room temperature water for 3 minutes.
3. After 3 minutes, gently rinse the sensor with clean water.
4. Lightly dab the sensor dry using a lint-free gauze. Do not touch the ring and pH-glass in the center of the sensor. Do not rub the sensor surface.
5. Inspect the ring around the pH glass to ensure it is brown and intact.
6. Inspect the sensor to ensure that the grooves on the sensor circumference are clean and intact.
7. Once the visual inspections are passed, remembrane the sensor using the Membrane Changer.