Australian Anaesthesia Allied Health Practitioners

Best Practice Guidelines for Checking the Aisys CS^2

Description	This document describes the best practice guidelines for checking the GE Aisys Anaesthetic Machine as set by AAAHP. It details both the recommended Level 2 and Level machine checks recommended at the beginning of each anaesthetic list and in between patients respectively.

Level 2 Anaesthetic Machine Check

Preliminary Checks

1. Ensure clinical areas (induction rooms) receiving patient under anaesthetic care has O^2 flow meter, a fully functional resuscitation device, monitoring and suction available (in line with hospital policy)
2. Check bulk gasses are in the appropriate range
3. Test Medical Gas Alarm Panel ensuring lights and audible alarm are fully functional
4. Check machine is plugged into an uninterrupted power supply and/or battery is fully charged
5. Ensure machine is appropriately 'earthed'
6. Ensure AGSS ball is floating in the 'Green zone'
7. Ensure machine moves freely, castor guards are present and brake pedal is fully functional
8. Check service dates of machine, monitors and cassette
9. Check resuscitation device is available and fully functional; check all valves are present and fully functional; ensure reservoir bag and tubing is attached
10. Turn machine **'ON'**. If the machine has been on for over 12 hours without a power up self-test, reboot machine by turning OFF then ON to allow self-tests to take place.
11. Turn patient monitor **'ON'**
12. Ensure circuit and soda lime is clear of condensation and any visible soiling/defects
13. Ensure bag-port limb is free of cracks and circuit is secure
14. Ensure water condenser trap is clear of fluid
15. Check gas sampling line is clean, clear and free of defects
16. Check D-fend water trap is clear of fluid
17. Check gas analyser reads 21% oxygen (+/- 2%) on the monitor when exposed to room air
18. Check O^2 Alarm limits are set to 21%

Aisys Electronic Checks

1. If an O2 cell is present:
   - Expose Circuit O^2 Cell and wait for the O2 reading to stabilise at 21% (+/- 1%)
   - Select **Done**
   - Re-insert O^2 prior to commencing electronic check
2. Press *Checkout* menu and select **Full Test**
3. Perform the following electronic checks by following screen instructions:
   - **Vent and Gas**
   - **Circuit Leak**
   - **Low Pressure Leak Test**
   - **Agent Delivery** (required to be performed if more than one vaporiser is in use within the facility. Perform this test with the alternative vaporiser that is used in the **Full Test**)
4. Confirm all checks completed have passed and date/time is reflected

One Gas Test

<u>Low Gas Tests</u>

1. Ensure gas supply on machine screen is reading above 380kpa for all wall gasses
2. Attach gas sample line to filter or angle piece then attach to ACGO, turning ACGO to the 'open' position (reflected on the machine monitor)
3. Start gas flow by starting anaesthesia
4. O^2 will flow at 6L per/min, ensure this reads 100% (+/- 2%) on both monitors.
5. Increase then decrease total flows, ensuring the electronic flowmeters responds appropriately
6. Set volatile agent on 2% ensuring this reads appropriately on both monitors. Turn off once this is observed
7. Reduce O^2 % to 21% to start the flow of medical air. Ensure this reads 21% (+/- 2%)
8. Increase then decrease the total flows, ensuring electronic flowmeters respond appropriately

Anti Hypoxic Guard and O2 Failure Alarm

<u>Anti Hypoxic Guard</u>

1. Begin the flow of Nitrous oxide by selecting 'Gas Set up' and selecting Nitrous
2. Decrease the O^2 % down to 25% and ensure the machine electronic safe guard does not allow you to dial it down further. Check the O^2 monitor does not fall below 25%.
3. Increase the O^2% to 50% nitrous and 50% O^2 ensuring this is reflected on the monitor

<u>O2 Failure Alarm and Nitrous Cut-off</u>

1. Disconnect the O^2 wall supply leaving the O2 hose hanging as a visual reminder that O^2 is disconnected
2. Ensure visible and audible alarm and confirm the nitrous falls to 0 on the monitor

High Pressure System Check

Oxygen Cylinder:

1. Turn on back up oxygen cylinder
2. Ensure O^2 is flowing and the monitor is reading 100% (+/- 2%)
3. Stop the flow of O^2 by ending case twice
4. Turn off O^2 cylinder and ensure the pressure on the monitor is reading 5000kpa or above.
5. Ensure the pressure does not fall, indicating no leak in the cylinder
6. Use the auxiliary O^2 meter to drain the machine of O^2, indicating the auxiliary O^2 is fully functional
7. Reattach O^2 wall supply and perform a tug test

If an air cylinder is present:

1. Disconnect Medical Air from the wall and leave hose hanging as a reminder of the disconnection
2. Open air cylinder and ensure pressure read 5000kpa or above
3. Begin the flow of air on machine by selecting 'start anaesthesia' and ensuring a reading of 21% (+/- 2%)
4. Stop the flow of air by selecting 'end case'. Turn air cylinder off and ensure the pressure does not fall indicating no leak in the cylinder
5. Reconnect Medical Air to wall supply and perform a tug test

If a nitrous cylinder is present:

1. Disconnect Nitrous Oxide from the wall and leave hose hanging as a reminder of the disconnection
2. Open nitrous oxide cylinder and confirm appropriate pressure of nitrous oxide present
3. Start case and ensure no nitrous oxide is present
4. Select 50% nitrous 50% O^2 ensuring this is reflected on the monitor (+/-2%)
5. Turn off nitrous cylinder and drain machine of nitrous oxide
6. Reconnect all wall supplies and perform a tug test

NB : If only one cylinder key is available, leave key on O^2 cylinder

Alternative O2 Check

1. Turn on alterative O^2 flow meter and set at 6L/min
2. Confirm gas analyser reads 100% (+/-2%) then turn off Alternative O^2 flow
3. Select End case twice and select 'Check out'

Emergency O2 Flush

1. Attach 2L reservoir to ACGO
2. Using the O^2 Flush, fill the reservoir bag within 4 seconds indicating a 35-70L flow
3. Remove reservoir bag and turn ACGO 'OFF', ensuring ACGO alarm on the monitor disappears.

CO2 Absorber Check

1. Visually inspect CO^2 absorber for condensation, colouring and cracks
2. Ensure the absorber is seated correctly
3. Replace CO^2 absorber when a $FiCO^2$ at 5mmHg with flows of 0.5-2L/min gas flow

Ventilator Check

1. Attach test lung to patient end of circuit with filter and catheter mount in place
2. Set bag/vent switch to vent and use O^2 flush to fill bellows to the top
3. Observe that the bellows do not drop indicating there are no leaks in the bellow housing.
4. Start case and observe Paw pressures do not exceed 5cmH20 with a 6L/min gas flow, indicating the pressure release valve is functional
5. Reduce total gas flows to 0.2L/min and ensure ventilator settings are set at; Volume Control Ventilation; 500mL; 10-12 RR; I:E Ration 1:2; P limit 40cmH20; Peep Off
6. Set bag/vent switch to vent and observe the bellows are moving freely and rising to the top of the housing.
7. Observe the tidal volume is achieved within 8-10 breaths (+/- 10%)

<u>High Pressure alarm:</u>

1. Apply pressure on the test lung during ventilation and confirm a visual and audible alarm when Paw exceeds 40cmH20
2. Release the pressure and observe the bellows return to regular tidal volumes and continue rising to the top of the housing (confirming the pressure release valve has not become unseated)

<u>Low Pressure alarm:</u>

1. Remove the test lung and observe the bellows dropping
2. Confirm an audible and visual alarm ‘Unable to drive bellows’ followed by ‘Ppeak low. Leak?’ are present.
3. Switch back to bag and end case

Circuit Leak Test

1. Select ‘Check out’ screen and reattach test lung
2. Close APL valve to 70cmH20 and pressurise circuit to over 30cmH20 using the O^2 flush
3. Observe the pressure is maintained for 5 seconds
4. Open APL valve observing the passive emptying of the bag (indicating the scavenging is not over active)
5. Close APL valve to 70cmH20 and squeeze each bag alternatively ensuring easy and even flow between valves and the unidirectional valves are moving freely
6. Open APL valve and squeeze both bags simultaneously confirming your APL valve is fully functional

Suction Test	1. Ensure suction is correctly assembled and is able to reach the patient (recommended 2-3M long) 2. Turn suction on 'MAX' and listen at suction tip to confirm patency from suction tip to gauge 3. Occlude suction and confirm suction gauge reaches –60kpa within 10 seconds 4. Turn on suction regulator and listen to suction tip to confirm regulator is fully functional at minimum and maximal levels 5. Confirm suction is set on maximum
Airway Equipment Check	1. Check 2 laryngoscope blades are present appropriate to the size of the patient—ensure the light is bright and white 2. Check availability of essential airway items: • Bougies and stylets • Selection of oropharyngeal airways • Selection of laryngeal masks • Cuff syringe • Selection of endotracheal tubes • Magill's forceps • CICO equipment
Monitoring Equipment Check	1. Pulse oximetry available and functioning 2. ECG leads present 3. NIBP cuff present—appropriate size for the patient 4. Pressure cables present 5. Temperature probe and cable available 6. Stethoscope present 7. NMT monitoring available All equipment must be clean and accessible
Emergency Drugs	1. Suxamethonium available and in date according to hospital policy 2. Check emergency drugs are stocked—including adrenaline, vasopressors, atropine, amiodarone
Auxiliary Equipment Checks	1. Check cannula and infusion equipment available 2. Check infusion pumps available and service stickers in date 3. Check warming equipment available and in date

Documentation	1. Sign documentation to record machine check has been completed to ANZCA PS31 standards and in accordance with hospital policy

Level 3 Anaesthetic Machine Check

This check is required to be completed immediately prior to every anaesthetic

Circuit Checks	Replace all consumables used during previous anaesthetic and check new consumables 1. Assemble circuit with new filter and catheter mount 2. Ensure circuit tubing is clean and clear of defects 3. Attach test lung and ensure machine is on 'Check out' screen 4. Close APL valve to 70cmH20 and pressurise to over 30cmH20 using the O^2 flush 5. Observe that the pressure is maintained for 5 seconds 6. Open the APL valve ensuring even scavenging is not overactive 7. Close APL valve to 70cmH20 and squeeze each bag alternately ensuring easy gas flow between the bags and the unidirectional valves are functioning 8. Open APL valve and squeeze both bags simultaneously confirming APL valve is fully functional 9. Select 'Circuit Leak' under the 'Check out' menu and follow instruction on screen 10. Ensure: • Vaporisers are refilled • Suction is reassembled and fully tested • Emergency drugs are restocked
Agent Delivery Check	If a vaporiser cassette has been changed between patients, complete below instructions: 1. Select 'Agent Delivery' and follow instructions on check out screen 2. Select 'Low P Leak' test and complete for a non-Desflurane cassette 3. Select 'Pass' or 'Fail' as appropriate (failed cassettes should be removed) 4. **Close ACGO to circle on completion**

References:

- ANZCA PS31(A) 'Guideline on Checking Anaesthesia Delivery System' 2014
- "Aisys CS^2 User's Reference Manual" GE Healthcare
- 'Best Practice Guidelines for Checking Aisys CS^{2}' New Zealand Anaesthetic Technician's Society (NZATS) 2017
- 'GE Aisys Anaesthetic Machine' Royal Brisbane and Women's Hospital (2024)
- 'Level II Anaesthetic Machine Check' TAFE Queensland