

LEVEL 2 ANAESTHETIC MACHINE CHECK

This guideline describes the Machine Check on the Aestiva Machine & AS3 Monitor

1. Preliminary

- Check bulk gas warning lights or Medical Gas Alarm panel.
- Check that there is a current and prominent service label on all anaesthesia delivery systems.
- Turn Systems Switch ON, turn monitor ON.
- Remove Aestiva O₂ sensor and calibrate to 21% (+/- 1) on air and confirm on ventilator control panel (VCP). Re-install into casing.
- Check gas sampling line is clean and free from defects.
- Check patency and date of sampling line water trap if present.
- Open sampling line to 'air' – to read 21% oxygen.
- Check AS3 low oxygen alarm is set at 18%.
- Check AS3 battery back up is charging.
- Turn on auxiliary common gas outlet (CGO).
- Attach gas sampling line to auxiliary CGO with a filter. (To reduce pollution, attach female/female connector to the filter and attach circuit Y end to this).
- Check machine can move freely.
- Check that scavenging flow indicator is in the green zone and gas analyser connection is secure.
- Ensure Resuscitation bag is patent, has a rebreathing bag and oxygen tubing attached.

2. BULK GAS SUPPLY AND RESERVE CYLINDERS

High Pressure System – leak, contents and analysis

NB: The Aestiva machine usually has only two connections for back up cylinders. The NZATS machine check will outline the checking process for an oxygen cylinder nitrous oxide cylinder combination.

High Pressure Leak Tests

- Close all flowmeters, turn Systems switch 'Off'
- Open, and then close both gas cylinders. (Allow several seconds for the reservoir tank to fill before closing off the oxygen cylinder).
- Check gauges of cylinders – a falling pressure indicates a high-pressure leak.
- Turn Gas switch 'On', open flowmeters and drain the machine again.

Contents and Gas Analysis

a) Open the Oxygen cylinder.

- Contents of cylinder (replace if 5000kpa or below)
 - Analyser confirms 100% oxygen +/- 3%
 - Turn off cylinder.
 - Drain machine of oxygen using the 'Flush'. (The flush may be used appropriately throughout the machine check i.e. when oxygen is the only gas in the machine).
- b) Open Nitrous Oxide cylinder**
- Ensure nitrous oxide available
 - Nitrous oxide is available but is not flowing.
 - Open oxygen cylinder
- c) Confirm: Nitrous oxide is now flowing with oxygen**
- Adjust settings on flowmeters – both nitrous oxide and oxygen to flow at 2 Litres.
- d) Confirm: Analyser displaying 50%-50% oxygen and nitrous oxide (+ or – 3)**
- Gas analysis completed
 - Turn off the nitrous oxide cylinder – drain. Turn off oxygen cylinder - drain.
 - Ensure key is returned to the oxygen cylinder.

3. ONE GAS TEST, GAS ANALYSIS AND FLOWMETER CHECK

Low Pressure System

All flowmeters should be left open throughout one gas testing

- Plug oxygen probe into wall lug (*Shraeder outlet*) and tug test.
- Confirm oxygen gauge reads approximately 4 bar.
- O₂ bobbin spins freely at both low and high flows and the movement is smooth.
- Confirm 100% oxygen (+/-3%) on gas analyser.
- Auxiliary Oxygen - test flowmeter to maximum flow.
- Disconnect O₂ wall connection and drain machine of oxygen using the 'Flush'.
- Plug medical air probe into the wall lug & tug test.
- Confirm medical air gauge reads approx 4 bar.
- Medical air bobbin spins freely at both low and high flows and the movement is smooth.
- Only medical air is flowing and reads 21% oxygen +/- 3% on the gas analyser.
- Disconnect medical air connection at wall and drain machine of medical air.
- Plug nitrous oxide probe into wall lug & tug test.
- Confirm nitrous oxide gauge reads approx 4 bar and nitrous oxide is not flowing.
- Reconstitute the wall supply of oxygen.
- *Confirm nitrous oxide is now flowing with oxygen.*
- Set oxygen and nitrous oxide flowmeters at 2 litres. Confirm 50% oxygen / 50% nitrous oxide on gas analyser (+ /-3%).

4. Anti-Hypoxic Device and Nitrous Oxide Flowmeter

- Turn oxygen flowmeter off to minimum flow (a basal flow rate of 50-75mls should remain).
- Turn the nitrous oxide flowmeter off then turn on, increase the flow of nitrous oxide to the top of the flowmeters and ensure the nitrous oxide bobbin spins freely.

a) Observe:

- The bobbins spin freely throughout the movement and with the increase of nitrous oxide there is a corresponding rise in the oxygen at a ratio of 3:1

b) Confirm :

- on the gas analyser that no less than 25% oxygen can be delivered when delivering nitrous oxide.

c) Confirm:

- the antihypoxic setting at both high and low settings.

d) Confirm:

- Adjust flows – set oxygen to 6L and nitrous oxide to 2L
- Disconnect oxygen wall supply. Oxygen failure alarm must sound and nitrous oxide must cut off.

e) Confirm:

- Reconnect wall supply of all gases
- Tug Test all pipeline connections including scavenging and suctioning.
- Close all flowmeters.

5. Vaporiser Flow Resistance Test & Back Bar and Vaporiser Leak Test

- Set the oxygen flow to 6 Litres.
- Adjust the vaporiser from 0 to 1% slowly. The O₂ must not decrease more than 1L/min / flow rate.
- Repeat test on second vaporiser if present.

a) Confirm:

- Turn off oxygen flowmeter.
- Check contents of each vaporiser.
- Check filling ports of each vaporiser are closed.
- Check dial turns to maximum setting for each vaporiser.
- Test lock out system for each vaporiser
- Turn 'OFF' Systems Switch.
- Turn the flow meters on one and a half turns.
- Test the leak test device by deflating bulb and occluding connector end of device. Ensure bulb does not re-inflate.
- Connect leak test device to auxiliary CGO.
- Compress and release vacuum bulb until the bulb stays depressed. The vacuum causes the floats to move but then settle. If the bulb re-inflates there is a low pressure leak.
- Test each vaporiser set at 1% repeating the above steps.
- Turn all Flowmeters off.

6. Oxygen Flush

- Attach test lung (2-litre bag) to the auxiliary CGO. Using flush fill test lung – *should fill within 4 seconds indicating a 35-70L/min delivery of oxygen.*

- Remove test lung. Remove sampling line from filter, reattach 'cap' onto filter gas sampling port.
- Attach filter to the distal end the breathing circuit then connect the test lung onto the filter creating a 'closed circuit'.
(NOTE – circuit must be tested with filter in-situ.)
- Switch off auxiliary CGO.

7. Circle Absorber

- Check colour of soda lime, check water drain port closed, close APL valve.

8. Circuit Leak Test

- Extend breathing circuit out and ensure circuits are correctly connected.
- Using the 'Flush' fill the circuit, re-breather bag and test lung until reaching a pressure just greater than 30cm H₂O on the airway pressure gauges.
- Confirm pressure holds for at least 5 seconds.

9. Two Bag test, APL Valves Function Test & Scavenging Function

- Open APL Valve. Observe spilling of both the re-breathing bag and test lung but ensure they are not emptying completely. (*Ensuring that scavenging is patent but not overactive*).
- Close APL valve. Apply positive pressure alternately and to both bags observing the free movement of the uni-directional valves and that there is no resistance detected in the circuit.
- Open APL valve and ensure easy and even gas spill when the re-breathing bag and test lung are squeezed simultaneously.

10. Ventilator Tests

- Set the *Bag/Vent* switch to Ventilator
- Push the flush to fill bellows
- Observe bellows do not fall (leak test)
- Turn Systems Switch 'ON'
- Set the oxygen flow to 5 L – check that the end expiratory pressure does not exceed 3cm H₂O on the airway pressure gauge
- Set the *Bag/Vent* switch to *Bag*. Reset the *Bag/Vent* switch to Ventilator
- Check the VCP reading of PEEP correlates with the airway pressure gauge
- Reduce oxygen flow to basal flow (25-72mls).
- Set the controls as *per hospital regimes e.g.*

Ventilator mode	Volume Control
Ventilator	Tidal volume – 400mls
Rate -	12
I:E ratio	1:2
P limit	40 cmH ₂ O
PEEP	OFF

a) Ensure:

- The bellows inflate and deflate during mechanical ventilation
- The ventilator displays the correct data
- Tidal volume is 400mls (+ or – 10%) after 6-8 breaths.

Ventilator High and Low Pressure Alarms

High pressure alarm

- Apply pressure to re-breathing bag to simulate high airway pressures. 'High Paw' should display on VCP and audible alarm will sound.

Confirm

Low pressure alarm

- Remove re-breathing bag from circuit. Low Ve will display on VCP and audible alarm will sound. VCP will display '*unable to drive bellows*' and '*patient circuit leak?*' and audible alarm will continue.
- Return bag/vent switch back to bag.

Machine left ready for use.

- Re-connect filter and sampling line to circuit. Attach appropriate face mask.

11. Suction

- Tubing should be approx. 2-3m in length.
- When occluded should reach a negative pressure of approx. 500mmHg (60Kpa) within 4 seconds.
- Check suction unit is assembled correctly.
- Check the regulator is functioning correctly on both settings.

12. Airway Equipment

- Selection of Guedal airways
- Sizes 3 and 4 MacIntosh Laryngoscopes.
- Syringe
- Magills forceps, clamp
- LMA's selection of sizes
- Endotracheal tubes – selection of sizes

Also Check There Is A Satin Slip (Stylet) And Gum Elastic Bougie Available

13. Check Emergency Drugs Including Suxamethonium

14. Monitoring Equipment

- Check that pulse oximetry is functioning and available.
- Check that ECG leads are available.
- Check that blood pressure cuff is available and of appropriate size for patient.
- Stethoscope
- Temperature probe and cable
- Nerve stimulator.
- Pressure cables

15. Other Apparatus To Be Used :

These should be checked according to specified protocols.

Attention should be given to:

- Intravenous cannulation and infusion equipment
- Warming equipment

AESTIVA ANAESTHETIC MACHINE CHECK - LEVEL 3

Note

This check is undertaken immediately before commencement of each anaesthetic

Step	Action
1	<ul style="list-style-type: none"> • Check a changed filter • Check a changed breathing circuit including the replaced filter.
2.	<p>Circuit Leak Test</p> <ul style="list-style-type: none"> • Extend breathing circuit out and ensure circuits are correctly connected. Include filter in the leak test and connect to test lung. • Using the 'Flush' fill the circuit, re-breather bag and test lung until reaching a pressure just greater than 30cm H₂O on the airway pressure gauges. Confirm pressure holds for at least 5 seconds. <p>Two Bag test, APL Valve Function Test & Scavenging Function</p> <ul style="list-style-type: none"> • Open APL Valve. Observe spilling of the re-breathing bags but not emptying completely. (<i>Ensuring that scavenging is patent but not overactive</i>). • Close APL valve. Apply positive pressure alternately and to both bags observing the free movement of the uni-directional valves and that there is no resistance detected in the circuit or filter. • Open APL valve and ensure easy and even gas spill when two breathing bags are squeezed simultaneously.
2	<p>Check all replaced equipment from previous case. Ensure patency, function and suitability:</p> <ul style="list-style-type: none"> • Suction tubing and tip • Laryngoscope blades • Other airway equipment – guedal airways LMA's, • ET Tubes, cuff syringe • Replace soiled receptacles • Introducers replaced as necessary
3	<p>Ensure all monitoring is cleaned, replaced as necessary and monitoring needs are made ready for next case.</p>
4	<p>Check drug levels are still adequate, especially emergency drug levels including Suxamethonium. Replenish as necessary.</p>
5	<p>Re-assemble IV cannulation and infusion equipment.</p>
NB	<p>If vaporiser is changed, repeat all tests in Step 5 as outlined in the LEVEL 2 check.</p>