

Excel 210 MRI Compatible Operation and Maintenance Manual
Anesthesia Machine

User Responsibility

This Product will perform in conformity with the description thereof contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, Datex-Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Datex-Ohmeda Field Service Support Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Datex-Ohmeda and by Datex-Ohmeda trained personnel. The Product must not be altered without the prior written approval of Datex-Ohmeda's Quality Assurance Department. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Datex-Ohmeda.

⚠ CAUTION

U. S. Federal and Canadian law restrict this device to sale by or on the order of a licensed medical practitioner. Outside the U. S. A. and Canada, check local laws for any restrictions that may apply.

Datex-Ohmeda products have unit serial numbers with coded logic which indicates a product group code, the year of manufacture and a sequential unit number for identification.

AAA A 12345

└─── This alpha character indicates the year of product manufacture and when the serial number was assigned; "Y" = 1995, "Z" = 1996, "A" = 1997, etc. "I" and "O" are not used.

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Warranty

1/Introduction

- ⚠ WARNING** Using an MRI system in conjunction with general anesthesia on cardiac patients, febrile patients, and patients with impaired ability to perspire may present a patient health hazard.

In this section

- Introduction to the Excel MRI Compatible Anesthesia System 1-1
- How to use this manual 1-2
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Introduction to the Excel MRI Compatible Anesthesia System

The Datex-Ohmeda commitment to meeting your anesthesia needs continues with the Excel Magnetic Resonance Imaging (MRI) Compatible Excel Anesthesia System.

Basic features

The Excel MRI System includes:

- Three gases, oxygen, nitrous oxide, and air. All gases have pipeline and cylinder connections.
- The 5125 MRI Compatible O₂ Monitor with adjustable high and low O₂ alarms, and built in battery and hardware self tests.
- A two vaporizer manifold.

MRI Compatibility

The Excel MRI is constructed primarily of non-ferrous materials to help prevent attraction to the cryogenic magnets in MRI systems.

The Excel MRI and attached accessories performed to specifications when tested together as a system directly next to an unshielded, 1.5 Tesla MRI unit with a magnetic fringe field below 0.23 Tesla (2300 Gauss).

Approved accessories

A wide variety of Datex-Ohmeda accessories have been approved for use in conjunction with the Excel MRI under test conditions:

- ⚠ WARNING** The MRI compatibility of these accessories applies to specific accessory models and is limited to use as part of the Excel MRI System. None of these accessories have been tested for stand alone use in an MRI environment or in magnetic fringe fields above 0.23 Tesla (2300 Gauss).

- Tec 4 or 5 vaporizers; keyed or funnel fill models.
- GMS Absorber, PEEP valve, and Bain Circuit adapter
- Waste Gas Scavenging Valve
- 121 Respirometer
- Standard or free flow suction regulator kits
- Auxiliary oxygen flowmeter
- Flip-up shelf

1/Introduction

- Storage cabinets
- Dovetail mounted accessories: a 1 x 3.5 inch post with two inch extension; a 12 inch IV Pole; a large case Tyco gauge; and holders and regulators for E-size O₂ and N₂O cylinders.

Because approval applies only to specific accessory models, consult the Illustrated Parts Section of this manual for Stock Numbers.

Safety features

The Excel MRI includes several important safety features:

- The Datex-Ohmeda Link 25 Proportion Limiting Control System limits the lowest oxygen concentration that can be delivered on the Excel MRI to a nominal 25% for O₂/N₂O mixtures at the common gas outlet.
- An audible low O₂ supply alarm alerts you if the O₂ pressure falls below a nominal 207 kPa (30 psig).
- N₂O and air flows stop if O₂ supply pressure falls below a nominal 138 kPa (20 psig).
- An interlock mechanism that helps prevent more than one Datex-Ohmeda Tec 4 or Tec 5 vaporizer from being “On” at once. An isolation system also helps prevent fresh gas from entering a vaporizer that is not switched “On.”
- Low battery alarms and built in self tests on the 5125 O₂ Monitor.
- Differentiated pipeline and cylinder gauges.
- Gas specific pipeline and cylinder connections.
- A guarded O₂ flush button.
- Color coded flow controls and pressure gauges.

Operator convenience

For your convenience, the Excel MRI also features:

- An O₂ power outlet
- Full length dovetail accessory mounting.
- A single action brake/footrest.
- Shelf space for additional monitoring.
- Large, easy-running casters and a compact frame.

How to use this manual

This manual covers the Excel MRI System and the MRI Compatible 5125 O₂ Monitor. Vaporizers, the GMS Absorber, the Waste Gas Scavenging Valve and other major accessories also have individual operation and maintenance manuals. A complete set of operation and maintenance manuals comes with the Excel MRI System. Datex-Ohmeda recommends that you keep this manual and all related manuals available for reference.

If you are using the system for the first time, read this manual first. Then read the operation and maintenance manuals for the system components. Before you go on to Chapter 2, “General Information,” make sure that you understand the symbols listed at the end of this chapter.

If you have used the Excel MRI before, complete the step-by-step set up procedure in Chapter 3. Then turn to Chapter 4 “Preoperative Checkout,” which is required before using the Excel MRI.

1/Introduction

Before cleaning the Excel MRI, read Chapter 5, “Maintenance,” carefully. This section also tells you how to change the O₂ Monitor battery and assemble and service the O₂ sensor (sensor cartridge replacement, disassembly for cleaning).


Chapter 6, “Troubleshooting,” helps you solve problems that may occur with the Excel MRI or the 5125 O₂ Monitor. For example, how can you tell if a low pressure leak is due to a vaporizer that you can replace or an internal fault that requires a service call? (If the leak follows a particular vaporizer and the external o-ring is in place, replace the vaporizer.)

Chapter 7, “Illustrated Parts,” tells you how to order replacement parts and accessories. It also lists part numbers for all operation and maintenance manuals associated with the Excel MRI System.

The Appendix lists Excel MRI and 5125 O₂ Monitor specifications and describes the internal pneumatic circuitry of the Excel MRI.










Please also take a moment to review the User Responsibility Statement on the inside of the front cover; it describes what is expected of you to maintain the Excel MRI. Also read the Warranty on the back cover; it outlines Datex-Ohmeda’s responsibility in case of a functional defect.

Symbols used in the manual or on the equipment






















 **Warnings** and  **Cautions** tell you about dangerous conditions that can occur if you do not obey all of the instructions in this manual.

Warnings tell you about a condition that can cause injury to the operator or the patient. Cautions tell you about a condition that can cause damage to the equipment. Read and obey all warnings and cautions.














Other symbols replace words on the equipment or in Datex-Ohmeda manuals. No one device or manual uses all of the symbols. These symbols include:

	On (power)
	Off (power)
	Standby
	Standby or preparatory state for a part of the equipment
	“ON” only for part of the equipment
	“OFF” only for part of the equipment
	Direct Current
	Alternating Current
	Protective earth ground

1/Introduction

	Earth Ground
	Frame or chassis ground
	Alarm silence button
	Equipotential
	Variability
	Variability in steps
	Plus, positive polarity
	Minus, negative polarity
	Lamp, lighting, illumination
	Movement in one direction
	Movement in both directions
	Lock
	Unlock
134°C	Autoclavable
	Non-autoclavable
	Type B equipment
	Type BF equipment
	Type CF equipment
	Caution, ISO 7000-0434
	Attention, consult accompanying documents, IEC 601-1
	This way up
	Dangerous Voltage

1/Introduction

	Input
	Output
REF	Stock Number
SN	Serial Number
	Systems with this mark agree with European Council Directive (93/42/EEC) for Medical Devices when they are used as specified in their Operation and Maintenance Manuals. The xxxx is the certification number of the Notified Body used by Datex-Ohmeda's Quality Systems.
	Read top of float
	Vacuum inlet
	Suction bottle outlet
O₂+	O ₂ Flush button
	Cylinder
	Isolation transformer
	Linkage system
	Risk of Explosion
	Low pressure leak test
	Bag position/ manual ventilation
	Open drain (remove liquid)
	Close drain
	Inspiratory flow
	Expiratory flow
O₂%	O ₂ sensor connection
	Mechanical ventilation

1/Introduction



End case



The primary regulator is set to pressure less than 345 kPa



The primary regulator is set to pressure less than 414 kPa



European Union Representative



Low O₂ alarm limit switch



High O₂ alarm limit switch



Battery test



Circuit test



Test switch

2/General Information

In this section

Identifying Excel MRI components and controls 2-1

Identifying 5125 O₂ Monitor components and controls 2-6

⚠ WARNING The Datex-Ohmeda Excel System must only be used with non-flammable anesthetic agents.

Identifying Excel MRI components and controls

The figures in this chapter, show control locations on Excel MRI System components. For more information on GMS Absorber, or vaporizer controls, refer to the individual operation and maintenance manual.

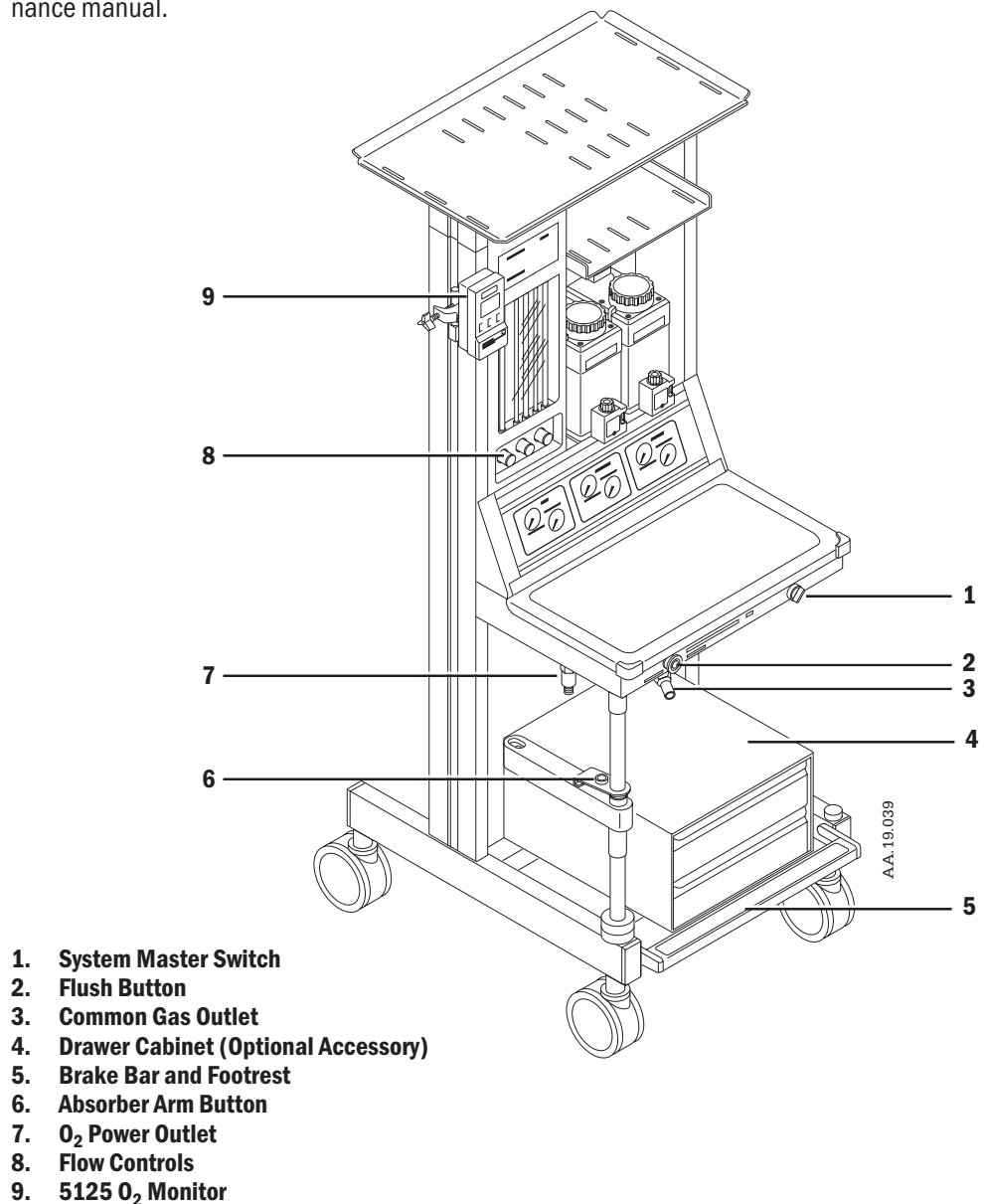


Figure 2-1
Front view of Excel MRI

2/General Information

Flow controls

With the system master switch set to “On,” turning a flow control counterclockwise increases flow, turning a flow control clockwise decreases flow. A linkage between the N₂O and the O₂ flow controls limits the lowest oxygen concentration that can be set on the Excel MRI to a nominal 25% for O₂/N₂O mixtures at the common gas outlet. Flow ranges are: O₂, 200 ml/min to 10 l/min (plus up to two additional turns of the knob); N₂O, 0 to 10 l/min (plus up to one additional turn of the knob); air, 0 to 15 l/min (plus up to one additional turn of the knob).

System master switch

Setting the system master switch to “On” allows gas to flow through the Excel MRI.

Flush button

Pressing the O₂ Flush button delivers 45-70 l/min of O₂ through the common gas outlet.

Common gas outlet

The common gas outlet delivers anesthetic gases to the patient circuit.

Brake

Push down to keep the Excel MRI from rolling. Lift up to release.

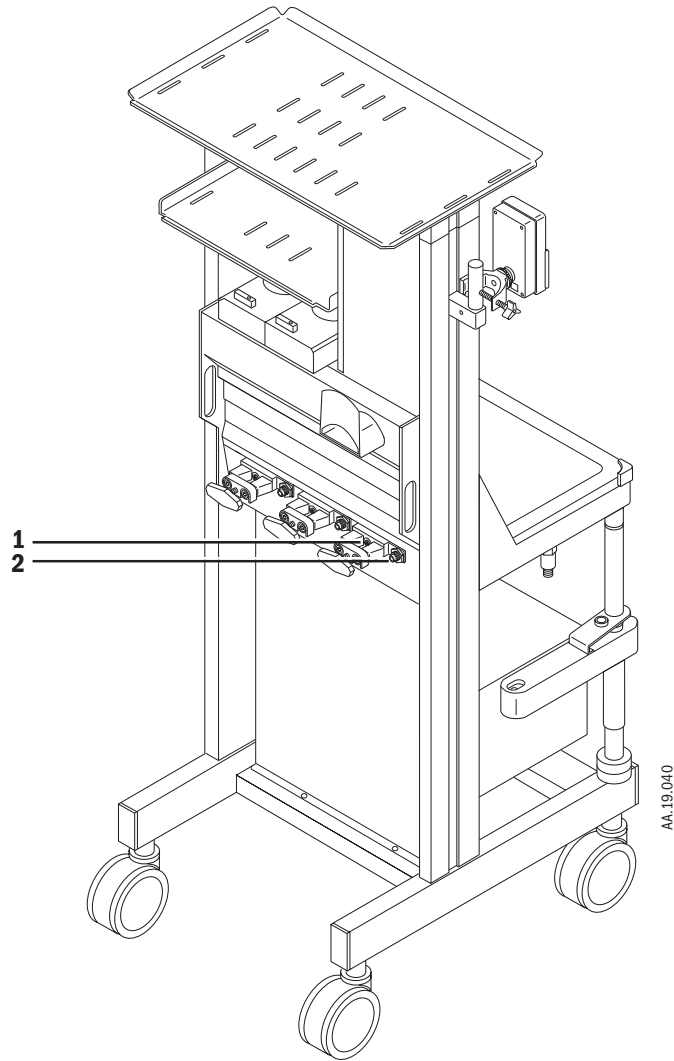
Absorber arm button

Press this button to adjust the height of the absorber arm.

O₂ power outlet

Provides drive gas for MRI compatible pneumatic equipment.

2/General Information



- 1. Cylinder Connection
- 2. Pipeline Connection

Figure 2-2
Excel MRI (rear)

2/General Information

Vaporizer concentration control

Press in the release and turn the concentration knob to the desired agent concentration. The locking lever must be fully clockwise (locked position) or the control will not turn.

Concentration control release

Pressing the release allows you to turn the concentration knob on the vaporizer.

Vaporizer locking lever

When the locking lever is completely counterclockwise, and the vaporizer concentration is set to "Off," you can mount or remove the vaporizer. Turn the lever clockwise to lock the vaporizer in position.

Vaporizer fill port valve

Opens the fill port valve so that agent can be added or drained.

Vaporizer key lock lever

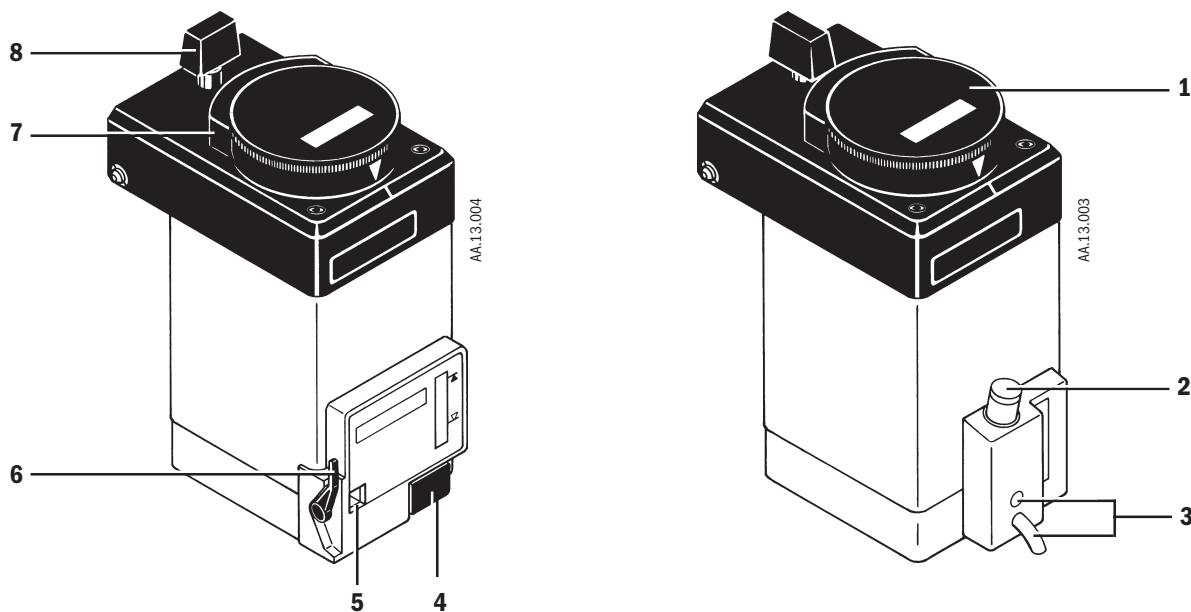
Holds the fill adapter from the agent bottle in place. To secure the adapter, lower the lever, insert the adapter, and raise the lever.

Vaporizer fill port (spout)

Unscrew and remove the plug to fill or drain vaporizers with funnel fill ports.

Drain Plug

Loosen (do not remove) with hex head portion of spout to drain agent. Tighten drain plug and install spout before use.



1. Vaporizer Concentration Control
2. Vaporizer Fill Port (Spout)
3. Drain Plug and Drain Port
4. Vaporizer Fill Port Valve
5. Vaporizer Fill Port (Keyed)
6. Vaporizer Key Lock Lever
7. Concentration Control Release
8. Vaporizer Locking Lever

Figure 2-3

Tec 5 vaporizers

2/General Information

Absorber drain plug

Unscrew and remove to drain condensate. Replace and tighten before use.

APL valve

This valve limits patient circuit pressure during manual ventilation (bagging).

Absorber check valves

Provide unidirectional flow through the absorber.

Airway pressure gauge

Absorber gauge to display inspiratory pressure.

Absorber release lever

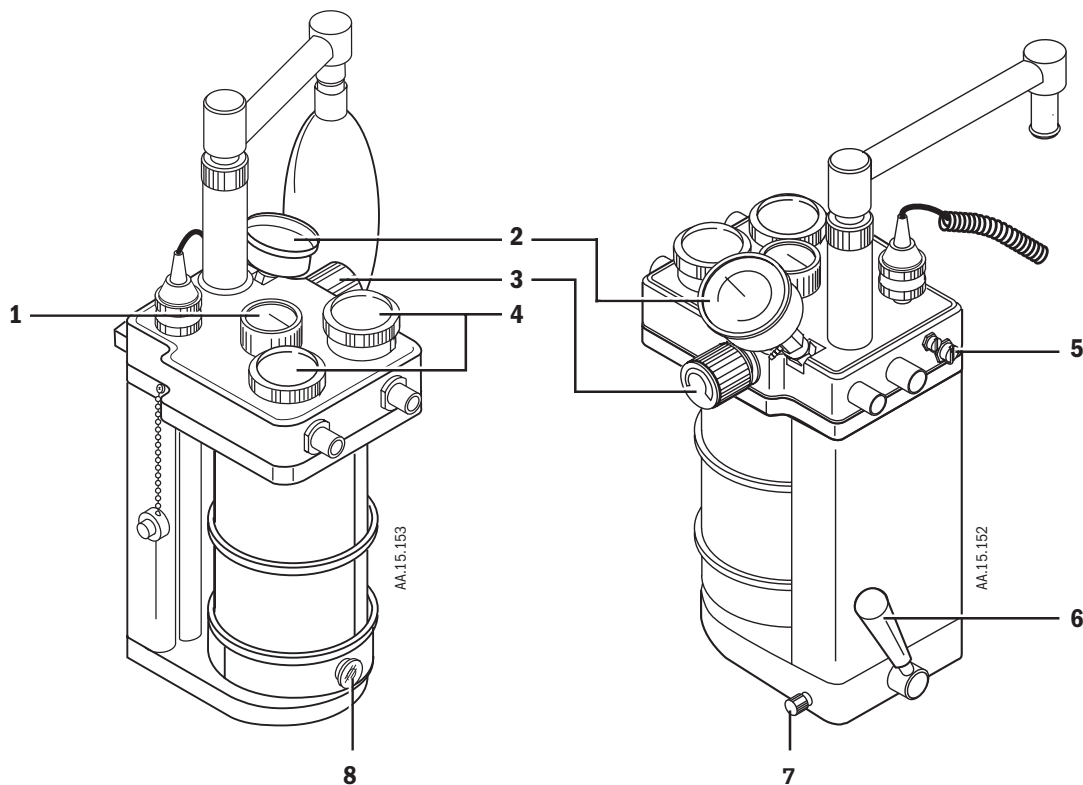
This lever should always be in the lock position during use. The release position lowers the absorber base so that you can remove the canisters.

Absorber mounting knob

Turn completely clockwise to attach the absorber to the mounting pin. Turn counterclockwise to remove the absorber.

Bag/Ventilator switch

This switch on the absorber selects either the bag arm (Bag position) or the ventilator bellows (Vent position).



1. Bag/Ventilator Switch
2. Airway Pressure Gauge
3. APL Valve
4. Absorber Check Valves
5. Fresh Gas Input
6. Absorber Release Lever
7. Absorber Mounting Knob
8. Absorber Drain Plug

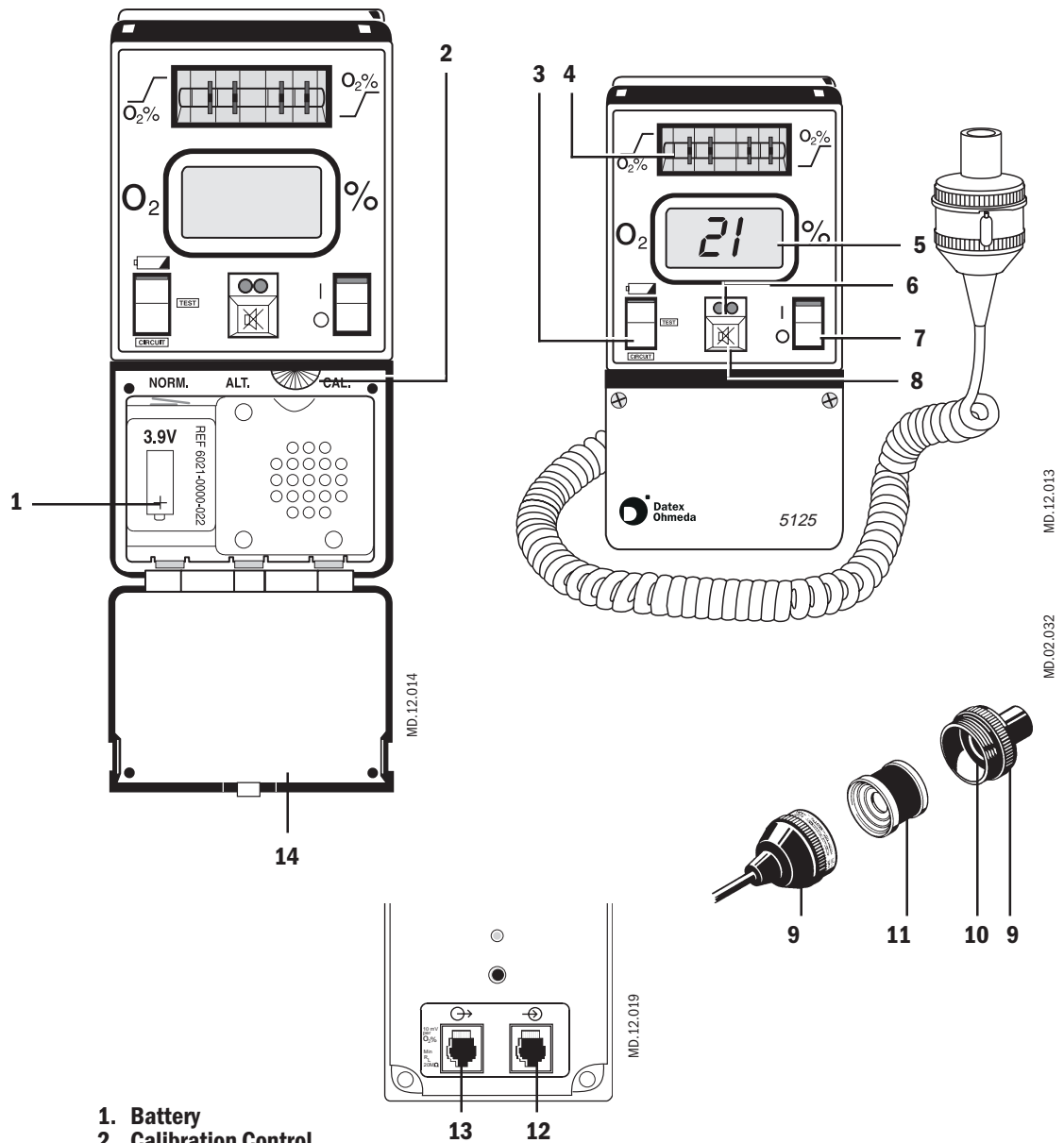
Figure 2-4

GMS Absorber

2/General Information

Identifying 5125 O₂ Monitor components and controls

Figure 2-5 identifies 5125 O₂ Monitor controls and major components.



1. Battery
2. Calibration Control
3. Test Switch
4. O₂ Alarm Limits
5. Display
6. Alarm LEDs
7. Battery Power Switch
8. Alarm Silence
9. Sensor Housing
10. O-Ring
11. Sensor Cartridge
12. O₂ Sensor Connection
13. Remote Connection (Refer to Appendix for Signal Specifications)
14. Front Panel

Figure 2-5

5125 O₂ Monitor controls

2/General Information

Test switch

Pressing down the top half of the switch (Batt Test) checks the battery condition. Holding down the bottom half of the switch (Circuit Test) checks the 5125 O₂ Monitor's electronic circuitry. For information about using the switch, refer to the section "5125 O₂ Monitor checks" at the end of Chapter 4.

Low O₂ alarm

Sets the lowest acceptable O₂ concentration. O₂ concentrations below 18% trigger a low O₂ alarm regardless of the alarm limit. Setting the limit below 18% also triggers an alarm.

High O₂ alarm

Sets the highest allowed O₂ concentration (0 to 99%). Setting the limit to 00% disables the alarm.

Display

Shows the measured O₂ concentration and any alarm messages.

Battery Power switch

Switches the 5125 O₂ Monitor "On" and "Off."

Alarm Silence

Pressing the alarm silence button silences all audible alarms, except for low O₂, until the next occurrence. Low O₂ alarms are silenced for 30 seconds. While the alarm is silenced, any flashing LEDs stay on continuously.

O₂ sensor housing and cartridge

The 5125 O₂ Monitor uses the standard Datex-Ohmeda O₂ sensor. The sensor cartridge is not part of the O₂ sensor assembly and must be installed before use. For additional information refer to the section "O₂ sensor maintenance" in Chapter 5.

Battery

The 5125 O₂ Monitor uses a "C" size, non-magnetic, 3.9 Vdc lithium battery. During operation, the "BATT FAIL" alarm continuously monitors battery strength.

Calibration control

Use the calibration control (CAL) to calibrate the 5125 O₂ Monitor for 21% and 100% O₂. Refer to "5125 O₂ Monitor checks" at the end of Chapter 4.

Notes

3/Setup

In this section

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Mounting gas cylinders	3-1
Mounting the 5125 O ₂ monitor	3-2
Circuit and monitoring connections	3-4

Before starting to setup the system

⚠ WARNING Remove the Excel MRI from the MRI room before starting the setup procedure. Do not add or remove any anesthesia system components while the Excel MRI System is in the MRI room.

1. Remove the Excel MRI System from the MRI room before starting the setup procedures.
2. Complete the setup procedure outside the MRI environment.
3. Do not move the Excel MRI System into the MRI room until you complete the first three sections of the checkout procedure (“MRI compatibility check,” “Initial checks,” and “Checking vaporizer mounting”).

Mounting gas cylinders

⚠ WARNING Use only non-magnetic gas cylinders on the Excel MRI System.

1. Set the system master switch to “Off.”
2. Swing out the yoke clamp.
3. Unscrew the tee handle until the screw is flush with the inside of the clamp.
4. Make sure that the cylinder valve is not covered by a dust cap. Remove dust cap if present.
5. Remove the old cylinder gasket if present and install a new gasket.

Note: Make sure that the old gasket does not stick to the cylinder.

⚠ CAUTION Use one cylinder gasket per yoke. Extra gaskets may cause a leak. Not using a cylinder gasket will also cause a leak.

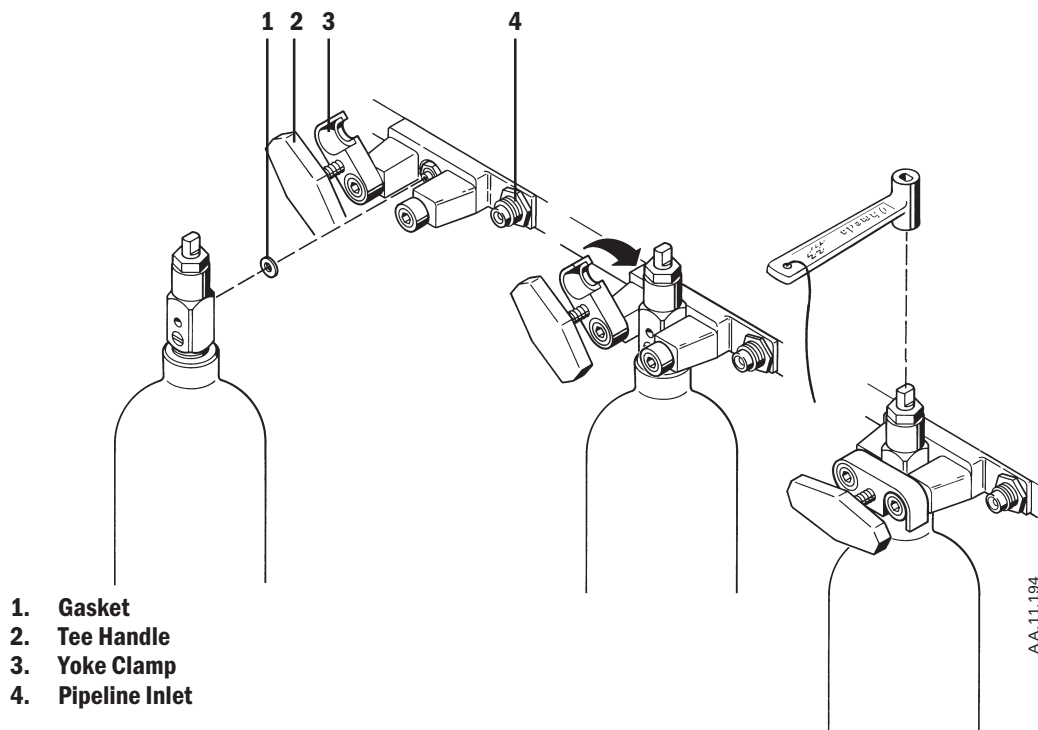


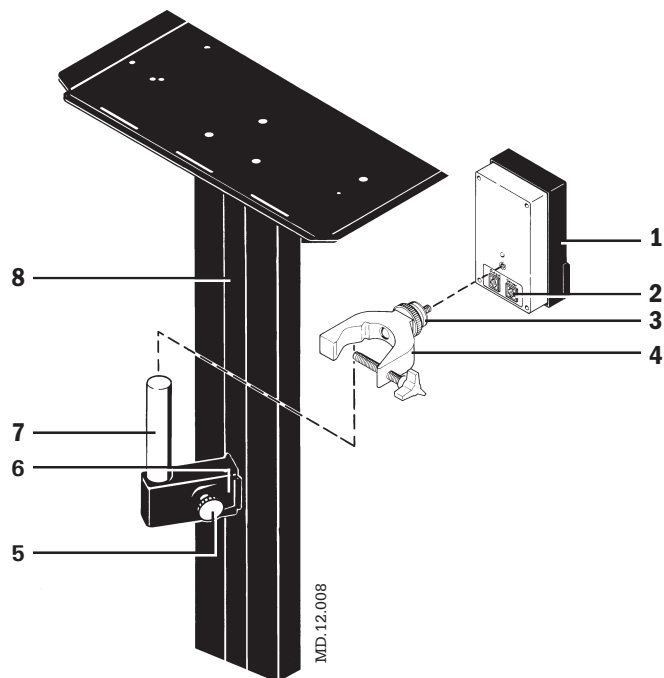
Figure 3-1
Mounting gas cylinders

6. Line the yoke index pins up with the cylinder post and swing the clamp closed.
7. Hand tighten the tee handle to secure the cylinder.
8. Install cylinder plugs and gaskets in all unused yoke positions.
9. Verify that the cylinder wrench is present.

⚠ WARNING Always close the cylinder valve when you are using a pipeline supply. If a cylinder valve is open and the pipeline and regulated cylinder pressures are equal, both supplies may be used simultaneously, leaving an insufficient reserve in case of pipeline failure.

Mounting the 5125 O₂ monitor

1. Tighten the thumb screw on the mounting post. This pushes a spring loaded plate in, reducing the width of the block.
2. Fit the mounting block into the mounting track on the left hand side of the Excel MRI. Loosen the thumb screw. This wedges the plate against the sides of the mounting track.



1. **O₂ Monitor**
2. **O₂ Sensor Connection**
3. **Nut**
4. **Clamp**
5. **Thumb Screw**
6. **Plate**
7. **Utility Post**
8. **Mounting Track**

Figure 3-2
Mounting the 5125 O₂ Monitor

3. Make sure that the utility post is secure and that both sides of the block are wedged into the rail.
4. Screw the clamp into the threaded hole in the back of the 5125 O₂ Monitor.
5. Attach the clamp to the utility post.
6. To adjust the angle of the 5125 O₂ Monitor, loosen the nut behind the monitor, reposition the monitor and tighten the nut.
7. Connect the O₂ sensor to the 5125 O₂ Monitor. Refer to the section “O₂ sensor maintenance” in Chapter 5 for O₂ sensor assembly instructions.

3/Setup

Circuit and monitoring connections

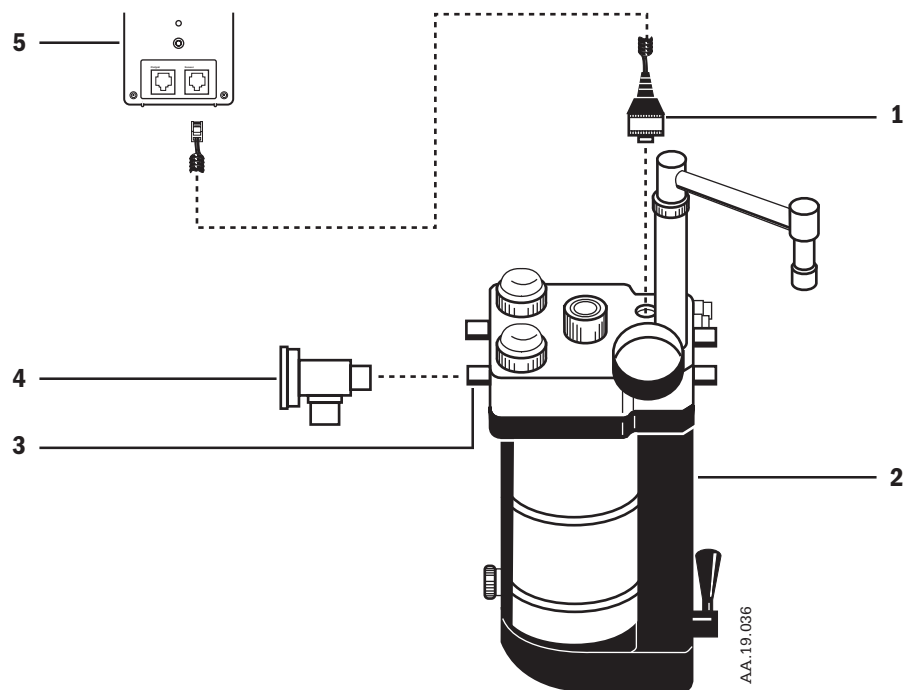
Use this section as a quick reference if you are already familiar with system connections. For detailed information and accessory part numbers, refer to the individual operation and maintenance manual.

⚠ WARNING Use only Datex-Ohmeda specified cables, hoses, and tubing for external connections. Alternative cables, hoses, or tubing could cause false sensor readings or damage to the system.

1. Set the system master switch to "Off."
2. Make sure that the absorber and the 5125 O₂ Monitor are securely mounted.
3. Make the monitoring connections:

⚠ WARNING Figure 3-3 and 3-4 show the only approved use of the 121 Respirometer with the Excel MRI.

- Refer to Figure 3-3 if you have a GMS absorber
- Refer to Figure 3-4 if you do not have a GMS absorber



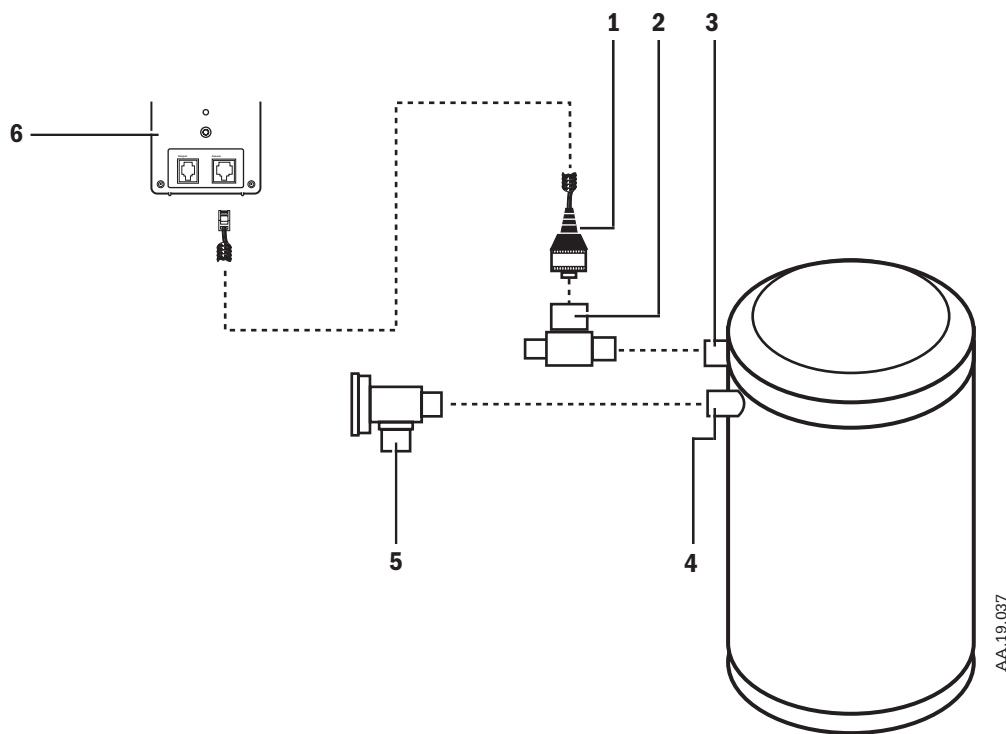
1. O₂ Sensor
2. GMS Absorber
3. Absorber Expiratory Port
4. 121 Respirometer
5. 5125 O₂ Monitor

Figure 3-3
O₂ sensor connection to a GMS Absorber

3/Setup

⚠ WARNING Any absorber used in an MRI environment must be MRI compatible.

⚠ CAUTION The cable on the O₂ sensor must point up to help keep the front (sensing portion) of the cartridge free of condensate.



1. O₂ Sensor
2. Adapter (22 mm Inner Diameter)
3. Absorber Inspiratory Port
4. Absorber Expiratory Port
5. 121 Respirometer
6. 5125 O₂ Monitor

Figure 3-4

O₂ sensor connection to a MRI compatible absorber other than the GMS

4. Determine if the O₂ sensor is ready for immediate use or if it must be allowed to stabilize:
 - a. The O₂ sensor is ready for immediate use if it has not been disconnected since the last time you used the Excel System.
 - b. If you just installed a new O₂ sensor cartridge directly from its sealed protective packaging, it must be connected and allowed to stabilize for five minutes before it can be used.

3/Setup

- c. If the O₂ sensor was disconnected or a new O₂ sensor was previously removed from its protective packaging, it must be connected and allowed to stabilize. Allow the O₂ sensor to stabilize for as many hours as it was disconnected or removed from its package (up to a maximum of 24 hours).

⚠ WARNING Any ventilator used with the Excel must have a high pressure alarm and relief system for the patient circuit.

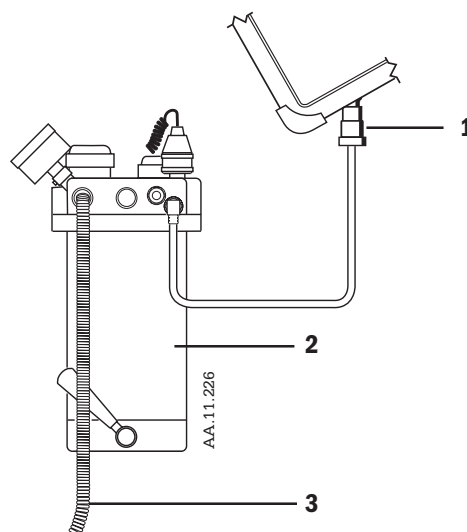
5. Make the fresh gas and gas scavenging connections:

⚠ WARNING The fresh gas hose must be securely connected to the common gas outlet and the absorber.

- Fresh gas input from the Excel MRI common gas output to the absorber input.

⚠ WARNING Do not connect the exhaust directly to a vacuum source. The vacuum may draw necessary gases from the patient circuit. Refer to the operation and maintenance manual for the waste gas scavenging valve for additional precautions and information.

- From the excess gas outlet on the absorber to a gas scavenging system. Use 19 mm corrugated tubing.



1. Common Gas Outlet
2. Absorber
3. Exhaust (Connect to Waste Gas Scavenging)

Figure 3-5

Excel MRI fresh gas connection

6. Verify that an O₂ cylinder is installed.
7. Set the Ventilator/Bag selector switch to the “Bag” position and install a breathing bag on the bag arm.
8. Turn all flow controls completely clockwise (minimum flow).
9. Continue with Chapter 4, “Preoperative Checkout.”

4/Preoperative Checkout

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5125 O ₂ Monitor checks	4-7

Before starting the checkout

This section—“Preoperative Checkout”—describes the minimum checks that should be made before the Datex-Ohmeda Excel MRI System is used on a patient. Do not use the system if it does not function correctly, as described in the preoperative checkout procedures; instead call a qualified service representative.

- ⚠ WARNINGS** Always complete the preoperative checkout procedures in this section before using the Excel MRI System on a patient.
- ⚠ Make sure that you understand the correct connection, use and necessary precautions for all system components before using the Excel MRI System. For additional precautions and information, refer to the operation and maintenance manuals for each component.

MRI compatibility check

- ⚠ WARNINGS** Do not move the Excel MRI into the MRI room until you have completed the first three sections of this chapter “MRI compatibility check,” “Initial checks” and “Checking vaporizer mounting.” Complete the rest of the checkout using the actual room, pipeline and electrical supplies and gas cylinders that will be used during the case.
- ⚠ Datex-Ohmeda strongly recommends using only monitor sensors that are compatible with MRI applications. Use of monitoring device sensors (ECG monitor leads, oximeter probes, etc.) in an MRI environment can cause injury. Check sensor locations on the patient’s body for signs of discomfort, heating or warming.
 1. Check that the gas cylinders are non-magnetic.
 2. Open any drawers and check that they contain only MRI compatible items. Test any suspect items. Remove any items that are not MRI compatible.
 3. If a ventilator is connected that is not MRI compatible (e.g. a Datex-Ohmeda 7000 or a 7800 Ventilator), remove it from the Excel MRI. Any ventilator used must be MRI compatible.
- ⚠ WARNING** Use only MRI compatible accessories with the Excel MRI. This includes monitors.
 4. Remove any other accessories that are not MRI compatible.

4/Preoperative Checkout

Initial checks

⚠ CAUTION Do not exceed the following shelf weight limits: top shelf, 23 kg (50 lbs); middle shelf, 11 kg (24 lbs). Verify that all equipment on the top shelf is securely strapped in place.

1. Check the overall integrity of the machine. Make sure that:
 - The casters are securely attached
 - All accessories are properly mounted
 - Setting the brake helps prevent the front casters from turning
2. Make sure the breathing circuit is complete, undamaged, and, if appropriate, contains adequate CO₂ absorbent.

⚠ WARNING Ensure that all hoses, tubing, and other circuit connections are made properly before using this anesthesia system. Failure to do so may result in patient injury. Refer to the operation and maintenance manuals for these devices.

3. Make sure that the following are not damaged:
 - Cylinder yokes
 - Pipeline inlets
 - Flowmeters and flow control valves
 - Pressure gauges
 - Vaporizers
 - Monitors and cables
 - All hoses and tubing
4. Make sure the breathing circuit is closed and connected to a gas scavenging system.
5. Check that the cylinders are properly installed.
6. Check that the vaporizers are properly installed.
7. Check that the cylinder wrench is available.
8. Check that the brake is set.
9. Make sure that required emergency equipment is available and in good working order.

4/Preoperative Checkout

Checking vaporizer mounting

You can use both Tec 4 and Tec 5 vaporizers with the Excel MRI System. If a Tec 4 and a Tec 5 vaporizer are used together, the interlock system still helps prevent more than one vaporizer from being switched “On” at the same time.

⚠ WARNING Do not attempt to modify the system to accept Datex-Ohmeda Tec 3 vaporizers. Tec 3 vaporizers are not MRI compatible.

1. Make sure that the tops of the vaporizers are parallel to the top edge of the manifold. Remount any vaporizers that are out of line.
2. Make sure the vaporizers are locked in place. Check the vaporizers’ locking knobs to ensure that the vaporizers are locked in place.
3. Attempt to lift each vaporizer off of the manifold. Remount any vaporizer that is not securely locked in place.

⚠ WARNING Do not use a vaporizer that continuously lifts off the manifold when its locking lever is in the lock position.

4. Check that the interlock rods are aligned. Attempt to switch “On” more than one vaporizer at a time. Try every combination that is possible with your system. If more than one vaporizer can be switched “On” at a time, remount the vaporizers and repeat this step.

⚠ WARNING Do not use the system if the vaporizer interlock system allows more than one vaporizer to be switched “On” at a time.

5. Fill the vaporizers as described in the vaporizer operation and maintenance manual.

Checking cylinder and pipeline supplies

Complete this section and the rest of Chapter 4 in the MRI room. The MRI System should be switched “On” during this portion of the checkout procedure.

1. With the cylinders closed, make sure the cylinder gauges read zero.

If the cylinder gauges do not read zero, the cylinders may have been previously opened. Briefly set the system master switch to “On” and open the flow control valves to bleed pressure.

⚠ CAUTIONS Open cylinder valves slowly to help avoid damaging the regulators.

⚠ Forcing the flow controls can cause serious damage to the Excel MRI.

2. Close all flow control valves and open the cylinders. Check that the cylinder gauges show adequate pressure.
3. Close all of the cylinder valves and note the value on each cylinder pressure gauge. The gauges must show less than a 690 kPa (100 psig) pressure drop in a five minute period. If the pressure drop exceeds this limit, the high-pressure circuit has an unacceptable leak.

4/Preoperative Checkout

If there is an unacceptable leak:

- a. Check for a defective cylinder gasket, an extra cylinder gasket, or a loose tee handle. Replace the gasket(s) with a single, undamaged gasket or tighten the tee handle.
 - b. Repeat the leak check. If the circuit still leaks, do not use the system for clinical applications. Call a qualified service representative for repairs.
4. Connect pipeline supplies and check that pipeline pressure gauges read approximately 310-345 kPa (45-50 psig).

Checking vaporizer back pressure

⚠ WARNING Follow the appropriate agent evacuation/collection procedures. Use the hospital gas evacuation system.

⚠ CAUTION Sudden surges can damage the flow control assembly. Make sure that all flow controls are fully clockwise (minimum flow or off) before setting the system master switch to "On."

1. Set the system master switch to "On" and adjust the O₂ flow to 6 l/min. Verify that the O₂ float does not oscillate or stick.

Note: The pneumatic alarm sounds briefly when the Excel MRI is switched "On."

2. Adjust vaporizer concentration from 0 to 1% click by click and observe the O₂ flow.
3. Return the vaporizer to "Off." If O₂ flow dropped by more than 1 l/min during step 2, contact qualified service personnel.

Note: If replacing the vaporizer allows the Excel MRI System to pass the vaporizer back pressure test, the fault is in the original vaporizer. Remove the original vaporizer from use and contact qualified service personnel to repair it.

4. Repeat steps 2 and 3 for each mounted vaporizer.

Leak checking the low pressure circuitry

1. Check the low pressure leak test device:
 - Block the inlet and squeeze the bulb until it is fully collapsed.
 - If the bulb inflates in less than 60 seconds, replace the leak test device.
2. Set the system master switch to "Off."

Note: The pneumatic alarm sounds when the Excel MRI is switched "Off."

3. Verify that all vaporizers are "Off." This changes gas routing.
4. Leak check the low pressure circuitry:

4/Preoperative Checkout

⚠ WARNING A low pressure leak means that metabolic gases and anesthetic agent are leaking into the atmosphere instead of going into the patient circuit. Low pressure leaks must be repaired before the Excel MRI is used.

Note: Gas supplies can be left “On” without affecting test results. With the system master switch set to “Off” there should be no flow through the system.

- a. Turn the flow controls one and a half turns counter-clockwise.
- b. Connect the low pressure leak check device to the common gas outlet.
- c. Repeatedly squeeze and release the bulb until it collapses.

Note: The vacuum from the leak check device may cause the floats to rise slightly. This is normal.

- d. If the bulb inflates again in 30 seconds or less, there is an unacceptable leak in the low pressure circuitry.
- e. Disconnect the low pressure leak test device.
- f. Set one of the mounted vaporizers to 1% and repeat steps b through d.
- g. Remove the test device to relieve the vacuum. Then, switch the vaporizer “Off.”
- h. Set the second mounted vaporizers to 1% and repeat steps b through d.
- i. Remove the test device to relieve the vacuum. Then, switch the vaporizer “Off.”
- j. Store the test device in the Excel MRI drawer.
- k. Turn all flow controls completely clockwise (minimum flow). Do not over tighten.

⚠ CAUTION Verify that all vaporizers are “Off” before continuing.

⚠ WARNING After performing the low pressure leak test, do not use the anesthesia system until the system has been purged with oxygen. Using a system that has not been purged with oxygen may result in incorrect gas mixtures and injury to the patient.

5. Reconnect the common gas outlet to the breathing circuit and the scavenging system, set the system master switch to “On,” adjust the O₂ flow to 1 l/min and purge the Excel MRI with O₂ for one minute.
6. Return the system master switch to “Off.”

4/Preoperative Checkout

Checking the gas flow controls

⚠ WARNING The Link 25 Proportion Limiting Control System sets a minimum O₂ concentration in the fresh gas stream when only O₂ and N₂O are used. Recirculating through an absorber or using a third gas may still cause a hypoxic mixture to be delivered, especially at low O₂ flow rates.

1. Either connect the pipeline supplies or slowly open the cylinder valves.
2. Set the system master switch to “On” and turn all flow control valves completely clockwise (minimum flow).
3. The oxygen flowmeter should show about 200 ml/min. The other flowmeters should show no gas flow.
4. Use the Link 25 Proportion Limiting Control System to check the N₂O flow control. Observe the following precautions:
 - Adjust only the N₂O flow control.
 - Start with the N₂O and O₂ flow controls at the minimum setting.
 - Increase the N₂O flow as specified in the table and make sure that the O₂ flow is in the allowed range.
 - If you overshoot a setting, turn the O₂ flow control clockwise until the N₂O flow decreases to the previous level.

Set the N ₂ O flow control to (l/min):	The O ₂ flow must be (l/min)	
	Minimum	Maximum
0.9	0.24	0.36
1.5	0.40	0.61
3.0	0.79	1.22
6.0	1.58	2.44
9.0	2.37	3.66

⚠ WARNING During operation, always use the O₂ Flow control to increase total gas flow and the N₂O flow control to decrease total gas flow.

5. Test link system tracking. Observe the following precautions:
 - Start with the N₂O flow control set to 9.0 l/min. Adjust only the O₂ flow control.
 - Start with an initial O₂ flow between 2.40 and 3.66 l/min and go from higher to lower flow rates.
 - If you overshoot a setting, turn the N₂O flow control counterclockwise until the O₂ flow rises to the previous level.

Set the O ₂ flow control to (l/min):	The N ₂ O flow must be (l/min)	
	Minimum	Maximum
3.0	7.36	11.41
1.0	2.46	3.80
0.5	1.23	1.90
0.3	0.74	1.14

4/Preoperative Checkout

⚠ WARNING Do not use the anesthesia system if the Datex-Ohmeda Link 25 Proportion Limiting Control System does not operate within permitted ranges. Using an incorrectly operating control system may result in incorrect gas mixtures, and injury to the patient.

6. Adjust all of the gas flows to mid scale. While you are turning the flowmeter knobs, the flowmeter floats must move smoothly.
7. Shut “Off” the oxygen supply either by closing the oxygen cylinder valve, or by disconnecting the oxygen pipeline supply. As pressure bleeds off:
 - The oxygen-supply failure alarm must sound.
 - All gas flow must fall to zero, with oxygen being the last gas to stop flowing.
8. Turn all of the flow control valve knobs completely clockwise to the minimum flow or closed position. Do not over tighten the valves.

Breathing system checks





Note: Refer to the GMS Absorber Operation and Maintenance Manual for additional information. A condensed version of the checkout is found on the back of the GMS Absorber.

1. Complete the GMS absorber checkout procedure.
2. Reconnect the unit for manual ventilation. Remove all occlusions from the circuit. Remove the test plug from the ‘Y’ piece and connect a test lung. Press the Flush button to fill the breathing bag. Set the Bag/Ventilator switch to the “Bag” position and adjust the APL valve to relieve at the desired pressure.
3. If the Excel MRI will not be used immediately, set the system master switch to “Off” and close all gas cylinder valves.

5125 O₂ Monitor checks

1. Switch the O₂ Monitor “On.”

Note: To avoid a long stabilization period, install a new cartridge (five minute stabilization time if just removed from package).

2. Set the  O₂% alarm switch to 20% and the  O₂% alarm switch to “00.”
3. Press down and release  **TEST** switch. Check that the “BATT OK” message appears for at least five seconds.
4. Press down and hold the  **CIRCUIT TEST** switch. Check that:
 - The alarm speaker beeps once.
 - All four messages appear (Figure 4-1).
 - An oxygen concentration between 88 and 102% is displayed.
 - Both alarm LEDs illuminate.
 - When you release the switch “BATT OK” remains for approximately five seconds.

4/Preoperative Checkout

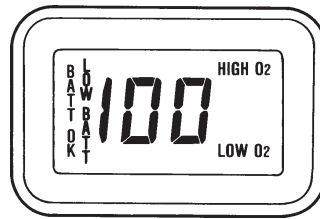



Figure 4-1
Circuit test display

5. Calibrate the O₂ Monitor at 21% O₂:
 - Expose the O₂ sensor to room air and allow the reading to stabilize for two minutes as room air fills the sensor housing.
 - If necessary, remove the two corner screws, open the lower front panel, and adjust the calibration control (CAL) until the display reads 20%. Then, adjust the CAL control until the display just indicates 21%.
 - If you cannot calibrate the O₂ Monitor, replace the sensor cartridge. Refer to “O₂ sensor maintenance,” in Chapter 5.
6. Set the $\overline{\text{O}_2\%}$ alarm switch to 22% (1% over the display reading) and check that:
 - The red LED flashes.
 - **LOW O2** appears in the display.
 - A two-pitch alarm sounds.
 - Pressing the  button stops the audible alarm for 30 seconds.
 - Adjusting the $\overline{\text{O}_2\%}$ alarm switch to 20% (1% below the display reading) stops the alarm.
7. Set the $\overline{\text{O}_2\%}$ alarm switch to 20% (1% below the display reading) and check that:
 - The yellow LED flashes.
 - HIGH O2 appears in the display.
 - An intermittent alarm sounds.
 - Adjusting the $\overline{\text{O}_2\%}$ alarm switch to 22% (1% over the display reading) stops the alarm.
8. At least once a month and following sensor cartridge replacement, calibrate the O₂ Monitor for 100% O₂:
 - Adjust the $\overline{\text{O}_2\%}$ alarm switch to 00% (alarm disabled).
 - Expose the O₂ sensor to pure oxygen and allow the display to stabilize for two minutes as oxygen fills the patient circuit.
 - Remove the two corner screws, open the lower front cover, and adjust the calibration control (CAL) until the display reads 99%.
 - Expose the O₂ sensor to room air and allow the display to stabilize for two minutes as room air fills the sensor housing. If the final reading is outside the allowed range 21 ± 3% (18 to 24%), the sensor cartridge is no longer linear and must be replaced. Refer to “O₂ sensor maintenance,” in Chapter 5.
9. If the system will not be used immediately, switch the 5125 O₂ Monitor “Off.”

5/Maintenance

In this section

Maintenance schedule	5-1
Cleaning and sterilization	5-2
Cleaning	5-2
Sterilization	5-3
Special precautions for rubber articles	5-3
O ₂ sensor maintenance	5-3
Installing a cartridge or disassembling the O ₂ sensor for cleaning	5-3
Cleaning and sterilization	5-6
Replacing the 5125 O ₂ Monitor battery	5-7

- ⚠ WARNINGS** This manual specifies Krytox[®] as an oxygen service lubricant. Do not use any lubricant on the Excel MRI that is not specifically approved for use on anesthesia or oxygen equipment. Oil and grease based lubricants burn violently and may explode in the presence of oxygen.
- ⚠** Static electricity is a fire hazard. Use only anti-static materials to cover the Excel MRI System and its components.

Maintenance schedule

This schedule lists the minimum maintenance required, based on normal use and typical environmental conditions. Heavier use or unusual environments may require more frequent maintenance. Before any cleaning or sterilization procedure check the section labeled "Cleaning and sterilization."

Before each use

Perform preoperative checkout procedure (includes 21% O₂ calibrations).

Daily

Clean the external surfaces.

Every two weeks

Drain and discard anesthetic agent from vaporizers. Less frequent changes may be required if the agent does not contain additives or stabilizing agents.

Monthly

Calibrate the O₂ Monitor with 100% O₂.

Apply Krytox to the threads on the yoke tee handle. Do not lubricate the absorber post assembly.

Every three months

Contact trained service personnel to perform a full checkout and scheduled service maintenance on the Excel MRI System (Excel MRI, absorber, and O₂ monitor).

Annually

Replace the external vaporizer port o-rings.

Service Datex-Ohmeda Tec 4 vaporizers at an authorized Datex-Ohmeda service center.

Replace the O₂ sensor cartridge. Cartridge life expectancy is one year at 50% O₂ and 25°C (77°F). Different operating condition (higher O₂ concentration, high temperature, etc.) can shorten cartridge life expectancy. Freezing may damage the sensor cartridge.

[®] Krytox is a registered trademark of Dupont de Nemours E.I. & Company Inc.

5/Maintenance

Every three years

Service Datex-Ohmeda Tec 5 vaporizers at an authorized Datex-Ohmeda service center.

As required

Install new cylinder gaskets.

Replace the absorbant in the GMS.

Replace the oxygen monitor battery.

Cleaning and sterilization

⚠ CAUTIONS Do not sterilize the Excel MRI or the 5125 O₂ Monitor.

⚠ Following ethylene oxide sterilization, quarantine the items in a well ventilated area to allow dissipation of absorbed ethylene oxide gas. Follow the sterilizer manufacturer's recommendations for specific sterilization periods.

Cleaning

Use this section as a quick reference once you are familiar with the cleaning procedures found in the individual operation and maintenance manuals.

External surfaces

To clean external surfaces use a damp cloth and a mild detergent.

Use the minimum amount of liquid necessary since excess liquid may leak into monitoring connections or other electrical components.

Sensor cleaning precautions

Wipe the O₂ sensor cable and housing with a damp cloth. Never immerse the O₂ sensor assembly in liquid. Exposure to liquids can damage the electrical contacts.

The O₂ sensor must be disassembled and the sensor cartridge removed for separate cleaning. The housing can be cleaned with a damp cloth (water, detergent solution or isopropyl alcohol). Corrosion from leaked sensor electrolyte can be removed with white vinegar under a fume hood.

The O₂ sensor cartridge contains an electrolyte (caustic). It can be wiped clean with a damp cloth (water, liquid disinfectant, or white vinegar; do not use alcohols). Special precautions are required. Refer to the "O₂ sensor maintenance" section in this chapter for detailed instructions.

Precautions for painted, metal, or plastic surfaces

Do not use abrasive cleaners. They can mar the finish.

Do not use anesthetic agent or glass cleaners on plastic or painted surfaces. They can mar the surface finish.

Always check cleaning product information to make sure that it is safe for aluminum, painted, or plastic surfaces.

5/Maintenance

Sterilization

Use this section as a quick reference once you are familiar with the sterilization procedures found in the individual operation and maintenance manuals.

Items that cannot be sterilized by any method

Excel MRI; 5125 O₂ Monitor

Items that can be sterilized with ethylene oxide

These items can be sterilized with ethylene oxide: the front half of the oxygen sensor housing and rubber and plastic articles. Refer to individual operation and maintenance manuals for disassembly instructions and additional information.

Items that can be sterilized with liquid agents

The rubber and plastic articles can be sterilized with a cold germicidal solutions.

Special precautions for rubber articles

Rubber goods deteriorate over time and are considered expendable. The presence of oxygen, ozone, ether, mineral or vegetable oils, phenols, cresols, terpenes, hydrocarbon solvents, chlorinated hydrocarbons, esters, or oxidizing agents will hasten deterioration.

Check rubber articles regularly. Replace them when any of the following signs of deterioration appear, swelling, tackiness, or cracking.

Conductive rubber goods lose their electrical conductivity with age.

To extend the useful life of rubber articles:

- Remove metal connectors immediately after use.
- Store rubber articles in the dark away from ozone sources (fluorescent light fixtures, electric motors, and diathermy machines).

⚠ WARNING Do not use talc, zinc stearate, calcium carbonate, corn starch or similar substances to prevent tackiness on rubber articles. Any substances used could contaminate or irritate the patient's respiratory tract.

O₂ sensor maintenance

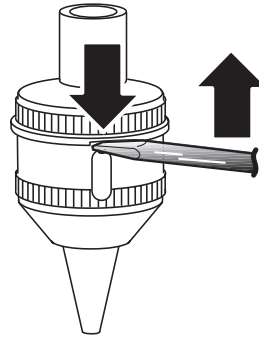
Installing a cartridge or disassembling the O₂ sensor for cleaning

⚠ WARNING Use protective gloves and eyewear when you open the O₂ sensor in case the cartridge is leaking. The sensor cartridge contains an electrolyte (caustic).

After servicing the O₂ sensor, complete the checkout procedure "5125 O₂ Monitor checks" at the end of chapter 4.

5/Maintenance

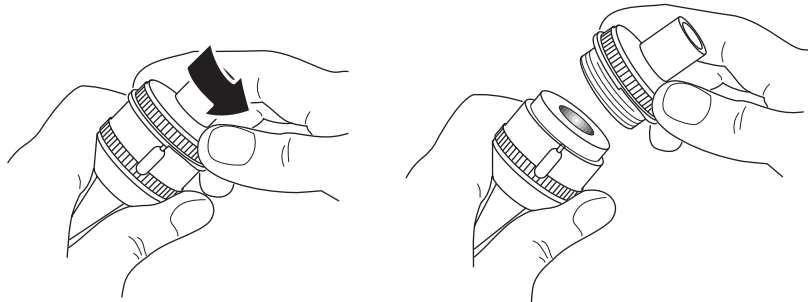
Note: The oxygen sensor cartridge is located inside the sensor housing. Handle the sensor cartridge with care to avoid damage.



MD.12.015

Figure 5-1

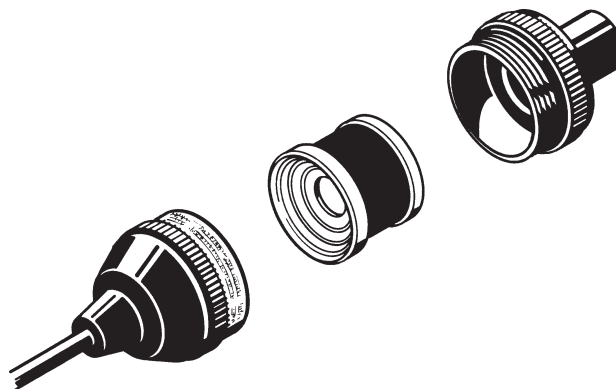
Hold the sensor housing, and depress the locking latch using a tool.



MD.12.016

Figure 5-2

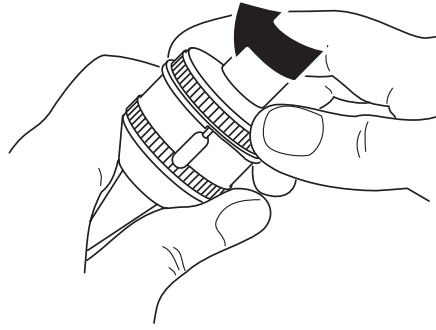
Twist to open, and unscrew the top half of the sensor housing. Lift the old sensor out.



MD.02.032

Figure 5-3

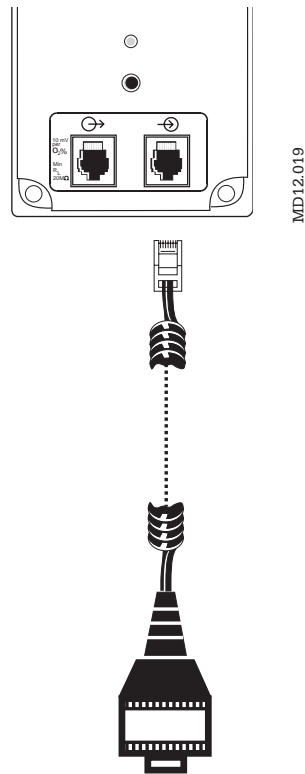
Install the new sensor cartridge with the circular contacts toward the rear of the sensor housing. Verify that the top half of the housing is unobstructed to ensure proper flow.



MD.12.017

Figure 5-4

Twist to close, and tighten the housing to form a gas-tight seal.



MD12.019

Figure 5-5

If necessary, immediately connect the O₂ sensor to the 5125 O₂ Monitor.

⚠ WARNING

Perform the 5125 O₂ Monitor Checks in chapter 4 after replacing the sensor cartridge to ensure the monitor is working properly. Allow at least 5 minutes for the sensor to stabilize.

5/Maintenance

Cleaning and sterilization

- ⚠ **WARNINGS** Use protective gloves and eyewear when you open the O₂ sensor in case the cartridge is leaking. The sensor cartridge contains potassium acetate (caustic).
- ⚠ Do not inhale any fumes generated by the oxygen sensor cleaning procedure. Such fumes can cause respiratory system or skin damage. The sensor cartridge contains potassium acetate (caustic).

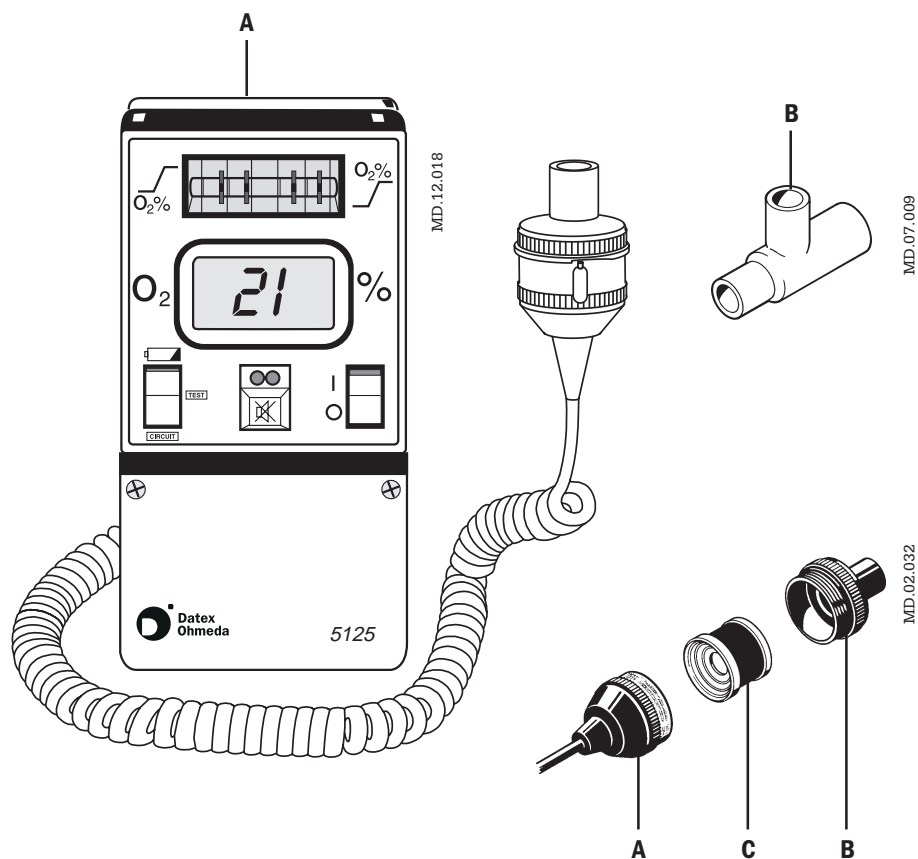


Figure 5-6
Cleaning and sterilization methods

Use the following methods to clean and sterilize the parts as labeled in Figure 5-6.

Method A: Wipe with damp cloth (liquid disinfectant, mild detergent solution, isopropyl alcohol); do not immerse, autoclave or gas sterilize; remove leaked electrolyte under a fume hood with vinegar.

Method B: Gas sterilize with ethylene oxide or clean with liquid disinfectant, mild detergent solution, isopropyl alcohol.

- ⚠ **CAUTION** Following ethylene oxide sterilization, quarantine the items in a well ventilated area to allow dissipation of absorbed ethylene oxide gas. Follow the sterilizer manufacturer's recommendations for specific sterilization periods.

Method C: Wipe with damp cloth (water, white vinegar, liquid disinfectant).

5/Maintenance

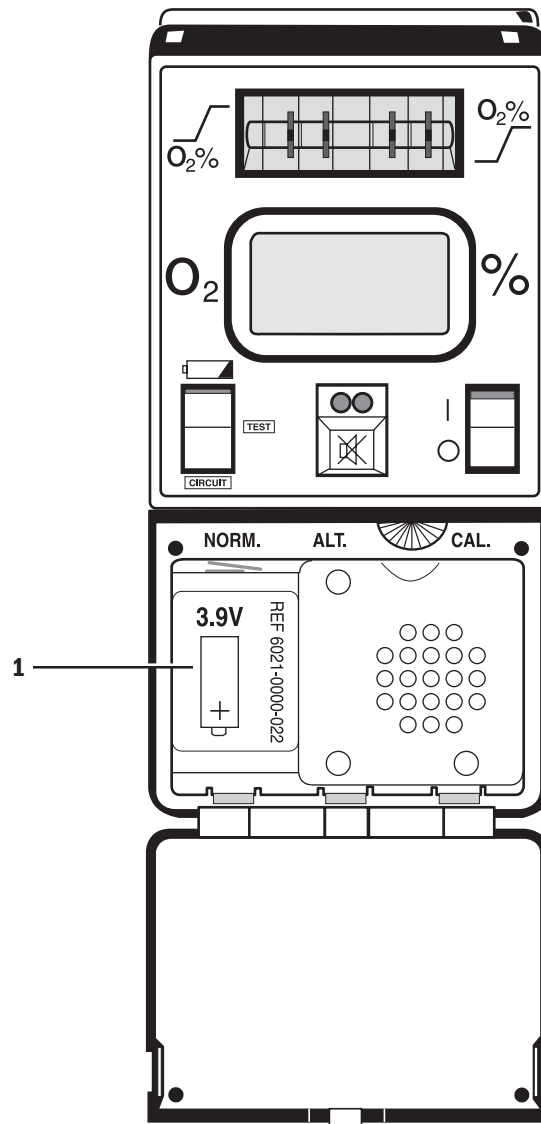
Replacing the 5125 O₂ Monitor battery

⚠ WARNING Use only the specified Datex-Ohmeda, non-magnetic batteries. Standard batteries are magnetic and can cause injuries if used in an MRI environment. Refer to the “Illustrated Parts” section for Stock Numbers.

The 5125 O₂ Monitor uses a non-magnetic, 3.9 Vdc lithium battery. The O₂ monitor batteries are not rechargeable.

The battery compartment is located behind the front cover. Remove the two corner screws and open the cover to gain access to the battery.

After replacing the battery, complete the checkout procedure “5125 O₂ Monitor checks” at the end of chapter 4.



MD.12.014

1. Battery

Figure 5-7
Replacing the battery

Notes

6/Troubleshooting

In this section

- Repair policy 6-1
- Problems with the 5125 O₂ Monitor 6-1
 - Calibration and drift 6-1
 - 5125 O₂ Monitor alarms 6-2
- Pneumatics problems 6-3

Repair policy

Do not use malfunctioning equipment. Make all necessary repairs, or have the equipment serviced by an Authorized Datex-Ohmeda Service Representative. After repair, test the equipment to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

To ensure full reliability, have all repairs and service done by an Authorized Datex-Ohmeda Service Representative. If this cannot be done, replacement and maintenance of those parts listed in this manual may be undertaken by a competent, trained individual having experience in the repair of devices of this nature.

⚠ CAUTION No repair should ever be attempted by anyone not having experience in the repair of devices of this nature.

Replace damaged parts with components manufactured or sold by Datex-Ohmeda. Then test the unit to ascertain that it complies with the manufacturer's published specifications.

Contact the nearest Datex-Ohmeda Service Center for service assistance. In all cases, other than where Datex-Ohmeda's warranty is applicable, repairs will be made at Datex-Ohmeda's current list price for the replacement part(s) plus a reasonable labor charge.

Problems with the 5125 O₂ Monitor

Calibration and drift

Cannot calibrate monitor

Replace the O₂ sensor cartridge. Refer to "O₂ sensor maintenance," in Chapter 5.

Drift in O₂ readings

Monitor O₂ readings. If O₂ readings fail to stabilize, replace the sensor cartridge.

6/Troubleshooting

5125 O₂ Monitor alarms

Note: When one message covers multiple conditions, the distinguishing feature is highlighted.

HIGH O₂

O₂ Display Shows: O₂ concentration
Alarm LED: Flashing Yellow
Alarm Silence: Until next occurrence

Measured O₂ concentration is above the alarm limit. Set the alarm limit to "00" to disable high O₂ monitoring.

LOW BATT

(two alarms)

O₂ Display Shows: – blank –
Alarm LED: Flashing Yellow
Alarm Tone: Intermittent

Immediate battery replacement required.

O₂ Display Shows: O₂ concentration
Alarm LED: Continuous Yellow
Alarm Tone: Three Beep Sequence

Battery is weak. Replace the battery before starting the case.

LOW O₂

O₂ Display Shows: Oxygen concentration
Alarm LED: Flashing Red
Alarm Silence: 30 seconds

Measured oxygen concentration is below the alarm limit.

– none –

(three alarms)

O₂ Display Shows: Oxygen concentration
Alarm LED: Continuous Yellow
Alarm Tone: Three Beep Sequence

The low O₂ alarm limit is set at or below 18%. This is not allowed. Set a higher low O₂ alarm limit.

O₂ Display Shows: 00
Alarm LED: Flashing Yellow
Alarm Tone: Intermittent

The O₂ sensor is disconnected or has malfunctioned. If the sensor is connected, flex the cable to check for broken wires. If the cable appears to be intact, replace the sensor cartridge. If the problem persists, contact qualified service personnel.

O₂ Display Shows: – blank –
Alarm LED: Continuous Yellow
Alarm Tone: Continuous

Internal monitor malfunction. Contact qualified service personnel.

6/Troubleshooting

Alarm summary table

Message	O ₂ Display	Alarm LED	Alarm Tone	Alarm Condition
LOW O ₂	O ₂ %	Flashing Red	Alternating Pitch	O ₂ % < low limit or 18%
HIGH O ₂	O ₂ %	Flashing Yellow	Intermittent Tone	O ₂ % > high limit
— none —	O ₂ %	Continuous Yellow	Three Beep Sequence	Low O ₂ limit <18%
LOW BATT	O ₂ %	Continuous Yellow	Three Beep Sequence	Weak Battery
LOW BATT	—blank—	Flashing Yellow	Intermittent Tone	Dead Battery
— none —	00	Flashing Yellow	Intermittent Tone	O ₂ sensor disconnection or malfunction
— none —	—blank—	Continuous Yellow	Continuous	Monitor Malfunction

Pneumatics problems

Low pressure leak test fails when vaporizer “On”

Check for correct vaporizer mounting. Tighten the vaporizer fill caps.

Make sure that there are external o-rings on all vaporizer manifold ports. Replace missing or damaged o-rings.

If the leak continues, move the vaporizer to another port. If the leak follows the vaporizer, use a different vaporizer. Do not use the leaking vaporizer until it has been serviced. If the leak stays with the port, i.e. any vaporizer put on that port leaks and the external o-rings are installed, contact qualified service personnel to repair the vaporizer manifold.

High pressure leak or inadequate ventilator gas supply

Make sure that the gas cylinder is correctly aligned and the tee handle is tight. Check that there is only one cylinder gasket and it is in good condition. Check external hose connections to the O₂ power outlet.

High pressure leak at gas block

Make sure that the cylinder is correctly aligned and the tee handle is tight. Install yoke plugs as required. Check that there is only one cylinder gasket and it is in good condition.

Low O₂ alarm (pneumatic)

This alarm sounds briefly when the Excel is first switched “On.”

If it occurs during operation, check the gas supply pressure (cylinder or pipeline). If necessary, switch to a reserve cylinder.

Notes

7/Illustrated Parts

In this section

Excel specific parts	7-1
MRI Compatible accessories	7-1
5125 O ₂ Monitor accessories	7-2
Where to find additional part numbers	7-2

This manual lists only customer replaceable parts used directly by the Excel or the 5125 O₂ Monitor. To locate additional part information find the part description in the section titled “Where to find additional part numbers.”

Excel specific parts

1102-3016-000	Vaporizer port o-rings, external (six)
0236-0042-801	Fresh gas hose
0219-3372-600	Yoke tee handle
0206-7129-525	Yoke plug
0210-5022-300	Cylinder gasket
0219-7210-300	Test lung
1001-3854-000	Krytox
0309-1318-800	Low pressure leak test device
2900-0001-000	Test plugs, bag port
0216-6764-870	GMS Mounting Pin (older style)
Included with Absorber	GMS Mounting Pin (New style)

MRI compatible accessories

⚠ WARNING The MRI compatibility of these accessories applies to specific accessory models and is limited to use as part of the Excel MRI System. None of these accessories have been tested for stand alone use in an MRI environment or in magnetic fringe fields above 0.23 Tesla (2300 Gauss).

1001-8968-000	Add on cylinder, O ₂ DISS
1001-8970-000	Add on cylinder, N ₂ O DISS
1603-3000-000	Respirometer 121 style
1010-8015-000	Suction regulator kit
1010-8016-000	Free flow suction regulator kit
1010-8021-000	Bracket for suction regulator
1010-8017-000	Auxiliary O ₂ flowmeter

7/Illustrated Parts

1001-8930-000	Flip-up shelf
0216-6819-800	1" x 3.5" Post dovetail mount
0216-6814-800	12" IV Pole Dovetail mount
1001-8957-000	Large Tycos Case Dovetail mount
0211-1100-300	BP adult inflation system Tycos
0207-8022-801	Bag to ventilator switch valve

5125 O₂ Monitor accessories

1001-3741-000	Non-magnetic lithium 3.9 Vdc C size battery
0237-2034-700	O ₂ sensor cartridge
6050-0005-406	O ₂ sensor (without cartridge)
6050-0005-438	O ₂ sensor front housing w/ o-ring
0210-0499-300	O-ring small
0212-0763-100	Sensor adapter

Where to find additional part numbers

System operation and maintenance manuals

All major system components have individual operation and maintenance manuals:

- GMS Absorber 0178-1742-000
- GMS Bain Circuit Adapter 0178-1752-000
- GMS PEEP Valve 0178-1753-000
- Tec 4 Vaporizer 0205-7106-300
- Tec 5 Vaporizer 1105-0100-000
- Waste Gas Scavenging Valve 0178-1728-000

Parts listed in the GMS Absorber Operation and Maintenance Manual

Look the following parts up in the GMS Absorber Operation and Maintenance Manual:

- Unidirectional (inspiratory and expiratory) check valve components
- Pressure gauge and inspiratory pressure sensing tee
- Drain plug
- O-rings
- Canister gaskets, screens, hose connections and seals

Appendix

In this section

Excel Pneumatics A-1

Excel MRI System Specifications A-4

Excel MRI Pneumatics

The Excel Gas Machine consists of the gas supply modules, the flow tubes and controls responsible for gas concentration, the vaporizer assemblies, and specialized alarm and “On” / “Off” functions provided by the oxygen supply. Most of the pneumatic circuitry is located underneath the tabletop.

The Excel MRI comes with gas supply modules for nitrous oxide, oxygen, and air.

Gas supply modules contain two parallel branches, pipeline and cylinder. The pipeline supply branch consists of a filtered pipeline connection and a pipeline pressure gauge. The cylinder branch consists of a filtered cylinder connection, a cylinder gauge, and a high pressure gas regulator that reduces cylinder pressure to a nominal 311 kPa (45 psig). When only one source is connected or switched “On,” check valves keep gas from leaking out through the unused branch. When both pipeline and cylinder supplies are connected, make sure that the cylinder valve is closed. Otherwise, cylinder gas could be depleted since the pipeline pressure is almost the same as the regulated cylinder pressure. A pressure relief valve in each gas supply module limits maximum pressure to 518 kPa (75 psig).

Shut-off valves control the flow of the nitrous oxide and the air. When the system master switch is set to “Off,” these valves are closed. When the system master switch is set to “On,” the pilot oxygen pressure holds them open. As long as the pilot pressure remains above the critical level, approximately 138 kPa (20 psig), the valves remain open. If the oxygen pilot pressure drops below this level, the shut-off valves close, stopping the flow of nitrous oxide and the air. You should notice the pilot oxygen flow through the oxygen flow tube whenever the system master switch is “On,” even if the oxygen flow control is turned completely clockwise (minimum flow).

Secondary regulators reduce the oxygen and nitrous oxide pressures to the levels required by the flow controls. The air goes directly from the primary regulator to the flow control. A gear linkage on the nitrous oxide and oxygen flow control knobs helps limit the lowest O₂ flow control setting to a nominal 25% of the N₂O flow control setting. A system of mechanical stops sets the maximum flows.

The mixed gas output of the flowmeter assembly goes through the selected vaporizer and into the patient circuit. A pressure relief valve on the common gas outlet limits pressure to approximately 27.6 to 38 kPa (4 to 5.5 psig) at 200 ml/min.

Pressing the “Flush” button connects pipeline or regulated cylinder oxygen directly to the gas machine outlet regardless of the position of the system master switch.

The same pilot pressure that opens the shut-off valves pressurizes the alarm canister. A regulator keeps the oxygen in the canister as long as supply pressure exceeds approximately 207 kPa (30 psig); range: 186 to 228 kPa (27 to 33 psig). If the oxygen supply pressure falls below this level, gas exits the canister through a reed alarm.

Appendix

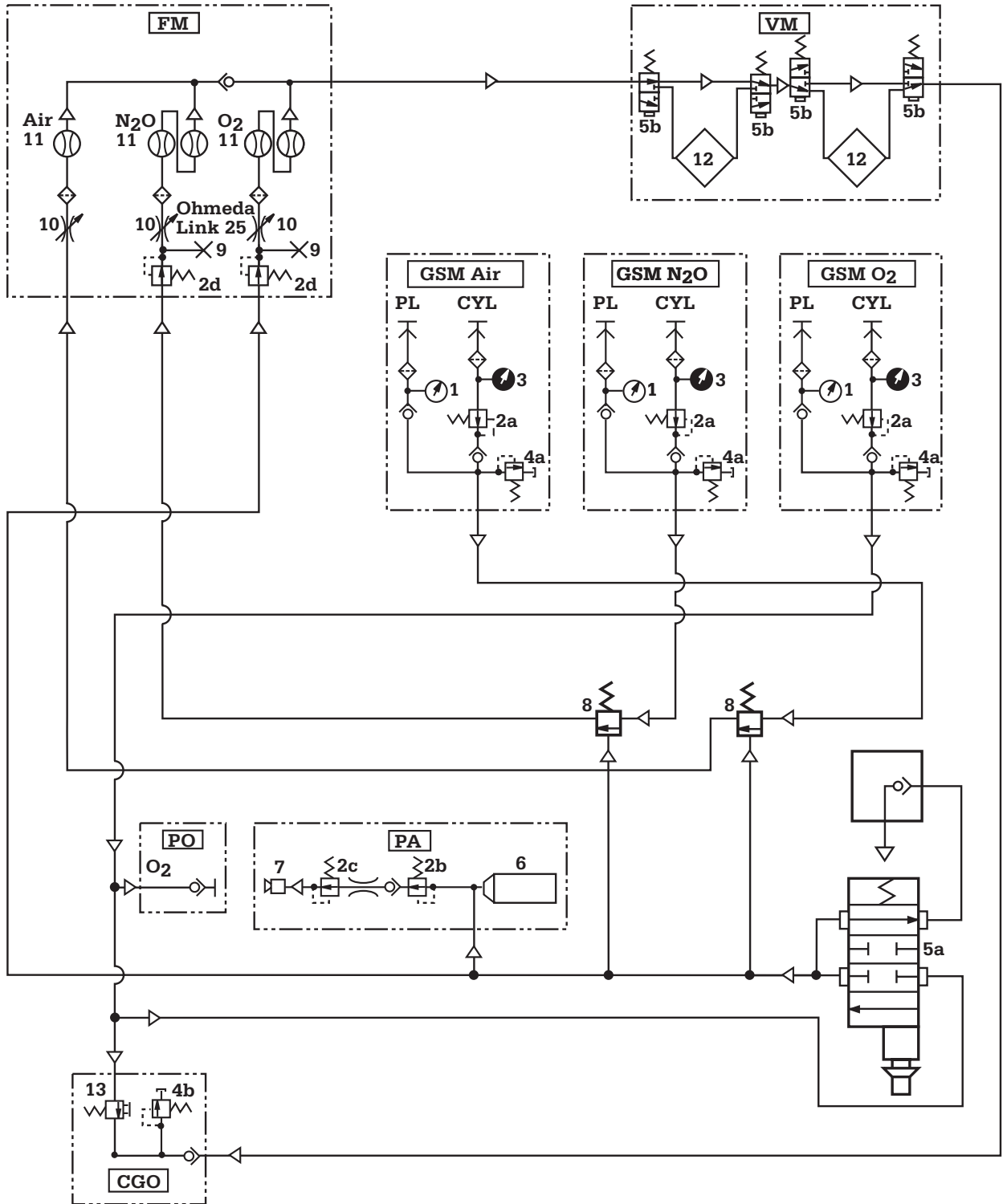










Figure A-1
Typical Excel pneumatic circuitry

AA.11.213

Appendix






Key to Subassembly Abbreviations

	Common Gas Outlet
	Cylindery Yoke
	Gas Supply Module (O ₂ , N ₂ O, Air)
	Flowmeter
	Pneumatic Alarm (triggers between 186 and 228 kPa [27 and 33 psig])
	Pipeline Connection (nominal 345 kPa [50 psig])
	Power Outlet (O ₂ for ventilator Drive gas)
	Vaporizer Manifold

Key to Numbered Components

1. Pipeline Pressure Gauge
2. Regulators
 - a. Primary Regulator
 - b. Alarm Regulator (set threshold)
 - c. Flow Regulator (alarm duration)
 - d. Secondary Regulators (262 ± 3.5 kPa for N₂O; 143 ± 26 kPa for O₂ at 2 l/min [38 ± 0.5 psig for N₂O; 20.75 ± 3.75 psig for O₂ at 2 l/min])
3. Cylinder Pressure Gauge
4. Pressure Relief Valves
 - a. 517 kPa (75 psig)
 - b. 27.6 to 38 kPa (4 to 5.5 psig) at 200 ml/min
5. Switches
 - a. System Master Switch
 - b. Vaporizer Selector Switch
6. Alarm Reservoir
7. Whistle
8. Shut-Off Valve
9. Secondary Regulator Test Points
10. Flow Control Needle Valves
(maximum flows: 10-14 l/min O₂; N₂O 10-12 l/min; Air 15-17 l/min.)
(minimum flows: 180 to 220 ml O₂; 0 ml all other gases)
11. Flowtube Assembly
12. Anesthesia Vaporizer
13. Flush Button/Valve

Key to Unnumbered Symbols

	Filter
	Check Valve
	Gas Circuit Fitting
	Gas Circuit Connection
	Direction of Gas Flow

AA.19.041

Appendix

Excel MRI System Specifications

Note: All specifications are nominal and subject to change without notice.

Dimensions

Weight:

Excel 210: 93.5 kg (206 lbs)

Options: Vaporizer, 17.6 kg (17 lbs); Absorber; 9.6 kg (21 lbs)

Dimensions:

Height: 168 cm (66 in) floor to upper most part of top shelf.

Depth: 76 cm (30 in) with casters and brake bar.

Width: 73.6 cm (29 in)

Shelves and drawers:

Middle Shelf:

Size: 29 x 31 cm (11.4 x 12.4 in)

Height: 19.8 cm (7.8 in)

Maximum Load: 11 kg (24 lb)

Top Shelf:

Size: 59.7 x 36 cm (23.5 x 14.2 in)

Maximum Load: 23 kg (50 lb)

Table-Top:

Height (above floor): 84 cm (33.5 in)

Size: 55.0 x 29.0 cm (21.7 x 11.7 in)

Drawer Cabinet (option):

Contains two 39.4 x 26.7 x 10.2 cm (15.5 x 10.5 x 4 in) drawers.

Absorber post mounting assembly:

Absorber Arm Length (varies slightly with arm style): 35.5 cm (14 in)

Vertical Adj (above floor): 25.4 to 66 cm (10 to 26 in)

Horizontal Adj: 16.5 to 27.9 cm (6.5 to 11 in)

Casters:

12.7 cm (5 in) diameter; front casters have a foot-operated brake-bar lock.

Common gas outlet:

Equipped with a latching, positive engagement, bayonet type connector. The common gas outlet connector will also accept standard 22 mm OD or 15 mm ID conical friction fit connectors.

Pneumatics

Pipeline input:

345 kPa (50 psig) pipeline supply required

DISS indexed connections for O₂, N₂O and air

Pipeline filter and check valve

Appendix

Cylinder input:

CGA pin indexed yokes
Input filter and check valve
Primary regulator output: nominal 310 kPa (45 psig)
Primary regulator diaphragm min burst pressure: 1,750 kPa (250 psig)

Maximum output:

Pressure relief valve set to: 517.5 kPa (75 psig)

Shut-off valves:

Shut-off valves stop all other gas flows if oxygen supply pressure falls to approximately 138 kPa (20 psig).

Flowmeter module:

Flow ranges:

O ₂	Double Tube 0.2-0.95 l/min and 1.0 l/min-10 l/min. Minimum O ₂ flow 200 ml/min.
N ₂ O	Double Tube 0.04-0.9 l/min and 1.0 l/min-10 l/min.
Air	Single Tube 1-15 l/min.

Flowtube assembly calibration:

Percent of Flow (Full Scale)	Accuracy (% of Reading)
100	±1.60%
90	±1.64%
80	±1.70%
70	±1.77%
60	±1.86%
50	±2.00%
40	±2.20%
30	±2.53%
20	±3.20%
10	±5.20%

Note: Flowtube assemblies are calibrated at 20°C (68°F) and 101.3 kPa (760 mm Hg). Different breathing circuit pressures, barometric pressures or temperatures will affect flowtube accuracy. In some cases, deviations due to different conditions may exceed the specified tolerances.

Common gas outlet relief valve:

27.6 to 38 kPa (4.0 to 5.5 psig) at minimum flow.

Low O₂ pressure alarm:

An alarm sounds for at least seven seconds if the O₂ supply falls below approximately 207 kPa (30 psig); range: 186 to 228 kPa (27 to 33 psig).

Oxygen flush button:

Recessed, self-closing push button provides a flow of 45-70 l/min when fully depressed.

Appendix

5125 O₂ Monitor specifications

Range:

0-100% O₂

Display resolution:

1%

Display update:

Three times per second

Alarms:

Audible and visual alarms for: high and low O₂, low battery, sensor malfunction or disconnection, internal malfunction.

Response time:

Typically 20 seconds for 90% of total change in O₂ concentration at 25°C (77°F).

Drift range:

±1% in eight hours

Linearity:

±1% of full scale

Accuracy:

±3% of full scale

Sensor cartridge life:

One year at 50% O₂; six months at 100% O₂ at 25°C (77°F)

Exposure to high CO₂ concentrations or elevated temperatures will shorten sensor life.

Battery:

Non-magnetic, 3.9 Vdc lithium battery

Nominal battery life expectancy is 600 hours.

Self tests:

Manual (test switch) and automatic

Remote connection:

Pin	Signal
1	Analog ground
2	Shield
3 & 4	Normally open switch connection for remote alarm silence. High to low transition silences alarm.
5	% O ₂ ; 10 mv = 1% O ₂ at 10 KΩ load impedance
6	Alarm status: high (>4.5 Vdc) = normal, no alarm; 10 msec pulse = alarm in progress; number of pulses in 320 msec specifies the highest priority alarm (1 = low O ₂ ; 2 = high O ₂ ; 3 = sensor malfunction/disconnection; 4 = dead battery; 5 = low O ₂ limit <18%; 6 = weak battery) alarm line stays low for remainder of 320 msec.

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Datex-Ohmeda

Corporate Office



Datex-Ohmeda Division
Instrumentarium Corp.
PO Box 900
FIN-00031 Helsinki
Finland
Tel 358 10 394 11
Fax 358 9 146 3310

North America

United States

Customer Service, Technical Support and Distribution Center

Datex-Ohmeda, Inc.
PO Box 7550
Madison, WI 53707-7550, USA
Tel 1 800 345 2700
Fax 1 608 221 4384

Equipment Service Center

Datex-Ohmeda, Inc.
1315 West Century Drive
Louisville, CO 80027-9560, USA
Tel 1 800 345 2755

Canada

Datex-Ohmeda (Canada) Inc.
1093 Meyerside Drive, Unit 2
Mississauga, Ontario
L5T 1J6
Canada
Tel 1 800 268 1472
Tel 1 905 565 8572
Fax 1 905 565 8592

Asia/Pacific

China

Datex-Ohmeda Pte. Ltd.
Room B416, COFCO Plaza
8 Jianguomennei Avenue
Beijing 100005, P.R. China
Tel 86 10 6526 9773
Fax 86 10 6526 0653

Datex-Ohmeda Pte. Ltd.
Room 1708, Yunlong Mansion
No. 122 Luoguo Street
Chengdu 610017, P.R. China
Tel 86 28 661 4424
Fax 86 28 676 2703

Datex-Ohmeda Pte. Ltd.
403 Huan Shi Dong Road
Room 1602, GIE Tower
Guangzhou, 510095, P.R. China
Tel 86 20 8732 2521
Fax 86 20 8732 2518

Datex-Ohmeda Pte. Ltd.
Room 2509 Lippo Plaza
No. 222 Huaihai Road (M)
Shanghai 200021, P.R. China
Tel 8621 5382 5657
Fax 8621 5382 1691

Datex-Ohmeda Pte. Ltd.
Room 809, Trurull Plaza
Wusheng Road
Wuhan 430033, P.R. China
Tel 86 27 8571 2536
Fax 86 27 8571 2655

India

Datex-Ohmeda (India) Pvt. Ltd.
Block EP & GP, Sector V
Plot XI-16, Salt Lake City
Calcutta 700091
India
Tel 91 33 3574002
Fax 91 33 3574001

Indonesia

Datex-Ohmeda Pte. Ltd.
Wisma Danamon Aetna Life 19th Floor
Jln. Jend Sudirman Kav. 45-46
Jakarta 12930, Indonesia
Tel 62 21 575 0864
Fax 62 21 575 0865

Japan

Datex-Ohmeda K. K.
TRC Annex 9F
6-1-1 Heiwajima
Ohta-ku, Tokyo 143-0006
Japan
Tel 81 3 5763 6801
Fax 81 3 5763 6838

Datex-Ohmeda K. K.
Technical Center
TRC A Bldg. AE 4-8
6-1-1 Heiwajima
Ohta-ku, Tokyo 143-0006
Japan
Tel 81 3 5763 6850
Fax 81 3 5763 6852

Korea

Datex-Ohmeda Pte. Ltd.
10th Floor, Sam Sung Building
36 - 1, Yoido-Dong, Youngdeungpo-Ku
Seoul, Korea
Tel 82 2 786 7421
Fax 82 2 786 7420

Malaysia

Datex-Ohmeda Pte. Ltd.
Level 2 Bangunan O' Connor
13 Jalan 223
46100 Petaling Jaya
Selangor, West Malaysia
Tel 60 3 754 7872
Fax 60 3 757 6948

Singapore

Datex-Ohmeda Pte. Ltd.
152 Beach Road
#12-05/07 Gateway East
Singapore 189721
Tel 65 391 8618
Fax 65 291 6618

Thailand

Datex-Ohmeda Pte. Ltd.
12th Floor (Unit F) Grand Amarin Tower
1550 New Petchburi Road, Makasan,
Rajathevi,
Bangkok 10320, Thailand
Tel 66 2 2071012/13
Fax 66 2 207 1014

Taiwan and Philippines

Datex-Ohmeda Pte. Ltd.
2nd Floor, No. 85, Chien-Kuo North
Road, Sec. 2
Taipei, Taiwan
Republic of China
Tel 886-2 2515-0457
Fax 886-2 2501-9136

Vietnam

Datex-Ohmeda Pte. Ltd.
522G Nguyen Tri Phuong St.
Ho Chi Minh City, Dist. 10 Vietnam
Tel 848 865 5875
Fax 848 862 5501

Australia

Datex-Ohmeda Pty. Ltd.
Units 1 & 2
149 Arthur Street
P O Box 356
Homebush
NSW 2140
Australia
Tel 61 132 229
Fax 61 297 461796

Europe

France

Datex-Ohmeda S.A.S.
Parc de Pissaloup, BP 10
8 Avenue Jean d'Alembert
F-78191 Trappes-Cédex
France
Tel 33 1 30 68 60 00
Fax 33 1 30 68 60 01

Datex-Ohmeda S.A.S.
17 rue Jean-Elysée Dupuy
F-69410 Champagne Au Mont d'Or
France
Tel 33 1 30 68 60 00
Fax 33 4 78 43 26 58

Germany

Datex-Ohmeda GmbH
Dr-Alfred-Herrhausen-Allee 24
D-47228 Duisburg
Germany
Tel 49 2065 691-0
Fax 49 2065 691-236

Italy

Datex-Ohmeda S.p.A.
Via Cassanese 100
20090 Segrate, Milan
Italy
Tel 39 2 21693431
Fax 39 2 26926226

Netherlands

Datex-Ohmeda B.V.
Kantemarsweg 18
Post Box 22
3870 CA Hoevelaken
Netherlands
Tel 31 33 253 5404
Fax 31 33 253 7223

Spain

Datex-Ohmeda S.L.
C/Manuel Tovar 26
28034 Madrid
Spain
Tel 34 1 334 26 00
Fax 34 1 358 12 84

United Kingdom

Datex-Ohmeda Ltd.
Ohmeda House
71 Great North Road
Hatfield Hertfordshire
AL9 5EN England
Tel 44 1707 263570
Fax 44 1707 260191

Latin America, Caribbean

Datex-Ohmeda Latin America
10685 North Kendall Drive
Miami, FL 33176, USA
Tel 1 305 273 9940
Fax 1 305 273 4382

Middle East

Datex-Ohmeda
Middle East Operations
P O Box 5527
Dubai, United Arab Emirates
Tel 97 14 822653
Fax 97 14 822659

Datex-Ohmeda, Inc.
Ohmeda Drive
PO Box 7550
Madison WI 53707-7550
USA
Tel 1 608 221 1551
Fax 1 608 222 9147
www.datex-ohmeda.com

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