

MINISCAV™

Scavenging Vacuum Pump

UK & European Model

User Manual



WARNINGS

To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth

Do not cover the MINISCAV™ or block the ventilation openings on the top and underside of the case

Ensure that there is sufficient space around the MINISCAV™ to promote adequate cooling of the device. Do not install or operate the MINISCAV™ in an unventilated enclosed compartment

Ensure that the exhaust transfer hose is securely attached to the MINISCAV™ and to the downstream exhaust ducting. A loud noise will be heard if the exhaust hose becomes disconnected

Do not block either the inlet or outlet of the MINISCAV™

Ensure that connecting hoses are not kinked or obstructed and are free of leaks

Do not permit the MINISCAV™ vacuum inlet to entrain liquid or solids

The MINISCAV™ should be placed outside of the patient's reach

Do not allow liquids to enter the case openings

Do not poke any object through any opening in the case

Do not use the MINISCAV™ in an environment with an ambient oxygen concentration in excess of 25%

Do not use the MINISCAV™ in the presence of inflammable anaesthetic agents

Do not use the MINISCAV™ with volatile anaesthetic agents

Do not attempt to modify or alter the MINISCAV™

Do not drop the MINISCAV™ or otherwise subject it to mechanical stress or impact

The MINISCAV™ is "MR Unsafe" – it must not be introduced into an MRI environment

About this manual

Information for the use of the MINISCAV™ may be found on pages 2 to 4 of this manual. Installation guidance is provided on page 5.

For users of the Porter Vacuum Control Block, additional guidance is given on page 7. Technical specifications for the MINISCAV™ are on page 8.

Please read the relevant sections of this manual before installing or using the MINISCAV™

Product Description

The MINISCAV™ is intended to assist in providing protection from occupational exposure to nitrous oxide, during clinical procedures employing administration of oxygen and nitrous oxide mixtures to obtain analgesia and/or minimal sedation.

The MINISCAV™ is an enclosed unit comprising a dual diaphragm vacuum pump and other components necessary for its operation (Fig 1). The exhaust outlet of the unit must be connected to an exhaust line vented to atmosphere outside of the building (Fig 2).

The vacuum inlet of the unit is typically connected to the breathing circuit or, in some cases, to an interface block mounted on the mixer/flowmeter. For specific information, refer to the instructions for use provided with your patient circuit and/or mixer/flowmeter.



Fig 1 MINISCAV™ scavenging vacuum pump

Indications for Use

The MINISCAV™ is intended for use with standard N₂O/ O₂ mixer/flowmeter delivery systems as used for analgesia in dental and oral surgery, obstetrics, trauma management and other minor surgery. It has been tested with systems from Porter (MDM and MXR, Digital MDM), Accutron (Ultra PC and Digital Ultra), and McKesson (MC1/2). It is not intended for use with General Anaesthesia equipment, or as a general substitute for an AGSS installation.

The MINISCAV™ provides a flow rate of 42 lpm \pm 3 lpm into a fixed vacuum of 90 \pm 10 mmHg; this is appropriate for scavenging of nitrous oxide from active double nasal hood breathing systems (e.g. Porter Brown, Accutron Clearview) without further restriction of vacuum flow rate. When used with these or with similar dental-type nasal hood active scavenging circuits, any control valves in the vacuum line should be opened fully.

Where scavenging is required with directly-coupled anaesthesia type breathing circuits, it is necessary to use an additional vacuum receiver which also provides for entrainment of room air to make up the difference between the scavenging output of the circuit and the flow rate of the MINISCAV™. However, the MINISCAV™ may not be compatible with such devices designed specifically for use with AGSS installations.

The MINISCAV™ should not be used with a Porter AVS (Automatic Vacuum Switch) or any similar device which cuts off vacuum by means of valve closure.

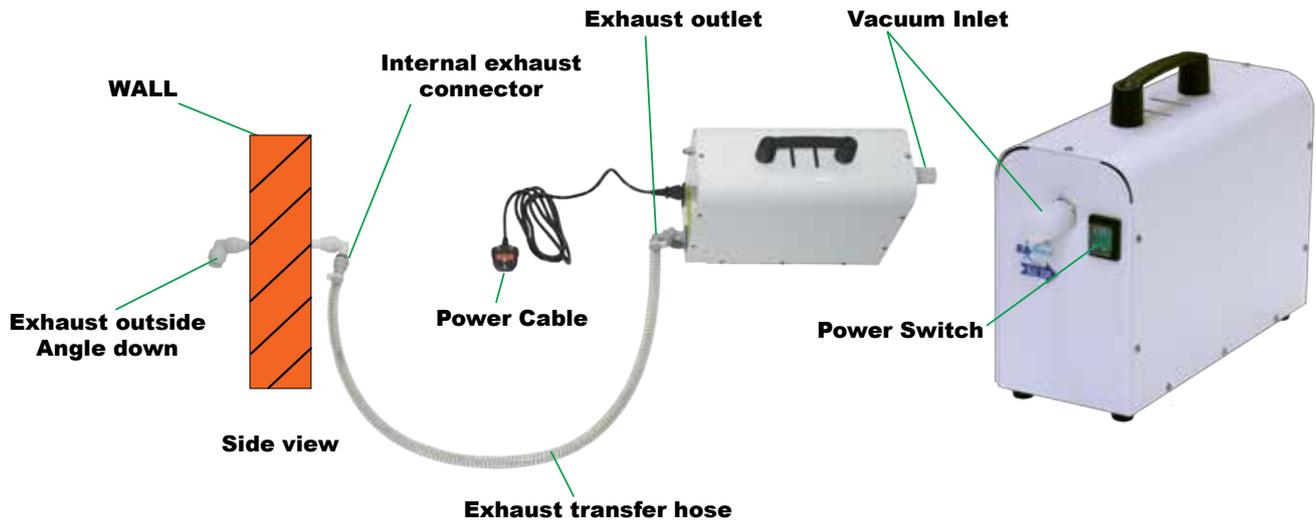


Fig 2 System view of basic MINISCAV™ installation

Operation

Connect the MINISCAV™ to an earthed socket outlet supplying power in accordance with the requirements stated on the rating plate.

The vacuum inlet connection is on the front of the MINISCAV™. When using a Porter Brown circuit with Vacuum Control Block (not supplied), insert the 'VAC' spout into the vacuum inlet (the opposite 'MASK' spout will not fit) and connect the vacuum hose from the breathing circuit to the 'MASK' spout (Fig 3). Ensure that the OFF/ON valve is open (i.e. in the 'ON' position), and fully open the variable control valve (actuator in vertical position). For other types of breathing circuit, insert the vacuum connector or adaptor into the vacuum inlet and fully open any vacuum control valves.

The symbols 'O' and 'I' on the green front panel switch indicate 'off' and 'on' respectively. The switch is illuminated when power is supplied to the motor.

After the completion of the clinical procedure, the MINISCAV™ should be switched off.

Pre-use check

Prior to use, check that all hose connections are complete and secure, and that tubes are not kinked, twisted or otherwise obstructed.

The presence of vacuum at the inlet may be confirmed by momentarily occluding the inlet with finger or thumb.

When the MINISCAV™ is running, the front panel switch will be illuminated, and a quiet humming sound will be heard from the pump. You may also hear slight air motion sounds at ambient air entrainment points in the mask or breathing circuit.

An abnormally loud sound from the MINISCAV™ or its exhaust line usually indicates that there is a leak from a damaged or severed exhaust connection: this should be checked and remedied before proceeding.



Fig 3 Porter vacuum control block in vacuum inlet (not supplied)

If a vacuum cannot be detected at the patient circuit, check that the MINISCAV™ is running and that connecting hoses are correctly fitted and not kinked or obstructed.

When using Porter Brown or similar double nasal hood masks, check that the flapper valve diaphragm (white on Porter Brown autoclavable liners) is present and functioning correctly; and that the liner (inner hood) is positively and securely engaged with the outer hood at both sides.

For further guidance on use of the Porter Brown vacuum control block please see Page 7.

Thermal cut-out

The MINISCAV™ incorporates thermal cut-out protection which operates in the event of overtemperature conditions. If the switch is illuminated and the motor is not running, it is possible that the thermal cut-out has operated. The cut-out will reset automatically when the motor has cooled. Switch off the MINISCAV™ to prevent inadvertent restarting; the cut-out should reset within 20-30 minutes.

If the thermal cut-out operates repeatedly, check that there is adequate ventilation around the MINISCAV™ and that it is not affected by external heat sources. In the event of continued trouble, contact RA Medical Services, or your local supplier, for advice or servicing.

Cleaning

Disconnect the power lead from the MINISCAV™. Clean the external surfaces of the MINISCAV™ with a soft cloth moistened with a mild soap or dilute detergent solution.

Do not use proprietary wet disinfectant wipes or a cloth that is soaking wet. Do not use aggressive cleaning agents. Do not allow moisture to enter the unit.

If required, the external surfaces may be buffed with a dry soft cloth.

It is not necessary to clean the exhaust transfer hose, as this is downstream of the patient. However, if required, this may be cold sterilised.

Maintenance and Service

Replace the exhaust transfer hose if there is any suspicion of wear, holes or tears.

With the exception of fuses, the MINISCAV™ is not user serviceable. If service is required, contact RA Medical Services or your local supplier.

If fuses require replacement, they must be replaced only with fuses of the same rating, as specified on the rating plate. If fuses blow repeatedly, contact R A Medical Services or your local supplier, to arrange servicing.

To provide assurance of continued safety and performance, it is recommended that the MINISCAV™ is serviced by the manufacturer, or its appointed territorial service agent, at two-yearly intervals. Contact R A Medical Services or your local supplier for details of available servicing options.

Installation Guidance

Site Planning

An earthed mains socket outlet is required within 1600mm of the planned location for the MINISCAV™.

The MINISCAV™ should be sited within approximately 2000mm of the operating position, e.g. the head end of a dental chair in the recumbent position, but should not be installed within possible reach of the patient.

A solid and non-resonant level platform structure is required to support the unit. The MINISCAV™ must rest on its own resilient feet and the body of the case should not be in contact any other structure. Failure to observe this may result in a greater level of noise and vibration when the unit is operating.

If the MINISCAV™ is to be installed in an enclosed compartment, it must be adequately ventilated.

If an exterior wall is available adjacent to the desired installation position, it may be drilled to accept the wall vent assembly. The MINISCAV™ will then connect directly to the wall vent using the supplied exhaust transfer hose. The standard length hose is 1000mm, but other lengths may be specified at time of order.

Care must be taken in selecting a position for the wall vent that is not in proximity with opening windows, doors, ventilation grilles or any other points of potential ingress. In some cases it may be necessary to prevent the opening of windows, either by physical means or by managerial edict. It is recommended that there be a clearance of 3000mm between the exhaust terminal and any potential ingress point. A similar clearance distance should be allowed between the exhaust terminal and any combustion flue terminal.

Be aware that nitrous oxide is denser than air. Avoid discharging the exhaust into any enclosed light well, dry moat or similar space with limited through air currents. Effluent should not be permitted to discharge into drains or underground service chambers.

If there is no convenient exterior wall adjacent to the desired position, it will be necessary to extend an internal exhaust pipeline to a suitable exit position. Such lines may be formed of flexible hose, rigid tube and connecting fittings, or a smooth bore pliable tube that may be conformed to gradual bends. When considering the course of pipework, avoid sharp bends and convolutions, keep the number of connectors to a minimum and minimise the use of upward-flow vertical sections.

The recommended maximum total length for the exhaust line is 15m, when using 15mm O.D. tube and standard fittings. It is often possible to use longer exhaust lines, but such installations are subject to special design considerations and the possible use of non-standard components. The advice of R A Medical Services, or your local supplier, should be sought in these cases.

Exhaust lines from multiple units should not be connected into a manifold: each unit requires a separate pipeline with its own exhaust terminal.

Installing the MINISCAV™

Prior to installing the MINISCAV™, unpack and check the contents of the package. It may be advisable to retain packaging materials for future service requirements.

At the selected location, a 15mm or 16mm hole should be drilled to accept the vent assembly.

The vent tube may be trimmed to length using a hacksaw or pipe cutter, but a minimum 8mm gap should be allowed between the wall and elbow connectors on both sides. It is advisable to seal the tube into the wall using a mastic type sealing compound or gap-filling adhesive compound. Be sure to tighten the nut sections of the elbow connectors after these are fitted onto the tube. Ensure that the elbow connector with stainless steel fauna screen is fitted externally, with screen to atmosphere and facing downwards.

Once the exhaust vent assembly and any internal exhaust pipeline has been installed, the MINISCAV™ may be placed in its operating position and the exhaust outlet connected to the exhaust pipeline via the supplied transfer hose. Ensure that the transfer hose connectors are securely retained.

Electromagnetic Compatibility

The MINISCAV™ is intended for use in the electromagnetic environment specified in the tables below. The user of this equipment should ensure that is used in such an environment.

Electromagnetic Emissions		
Emissions	Compliance according to	Electromagnetic environment
RF emissions (CISPR 11)	Group 1	The MINISCAV™ does not use or generate RF energy. Operation is unlikely to cause any interference in nearby electronic equipment
CISPR Emissions Classification	Class B	The MINISCAV™ is suitable for use in all types of establishment, including residential buildings and others directly connected to the public low voltage distribution network
Harmonic emissions (IEC 61000-3-2)	Class A	
Voltage fluctuations / flicker (IEC 61000-3-3)	Complies	

The device operated normally and without detriment throughout all of the tests described in the table below.

Electromagnetic Immunity		
Immunity against	IEC 60601-1-2 test level	Electromagnetic environment
electrostatic discharge, ESD (IEC 61000-4-2)	contact discharge: 6 kV air discharge: 8 kV	The MINISCAV™ contains no ESD sensitive components and no special precautions against ESD are necessary
electrical fast transients and bursts (IEC 61000-4-4)	power supply lines: 2 kV	Mains power quality should be that of a typical commercial or hospital environment
surges on AC mains lines (IEC 61000-4-5)	common mode: 2 kV differential mode: 1 kV	
power frequency magnetic field 50/60 Hz (IEC 61000-4-8)	3 A/m	Equipment which emits high levels of power line magnetic fields (in excess of 3A/m) should be kept at a distance to reduce the likelihood of interference
voltage dips or short interruptions on AC mains input lines (IEC 61000-4-11)	dip >95%, 0.5 cycles dip 60%, 5 cycles dip 30%, 25 cycles dip >95%, 5 seconds	If continued operation is required during supply interruptions, the user should provide an uninterruptible power source
conducted RF (IEC 61000-4-6)	150 kHz to 80 MHz 3 Vrms outside ISM bands*	Recommended separation distance (d metres) between device and RF source: d = $\sqrt{1.2P}$ up to 800 MHz, d = $\sqrt{2.4P}$ 800 MHz to 2.5 GHz, where P = transmitter output power in watts
radiated RF (IEC 61000-4-3)	80MHz – 2.5 GHz 3 V/m	
*The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are: 6.765 MHz – 6.795 MHz, 13.553 MHz – 13.567 MHz, 26.957 MHz – 27.283 MHz and 40.66 MHz – 40.70 MHz		

Porter Vacuum Control Block

Additional user guidance for use of the Porter Vacuum Control Block with the MINISCAV™

The Porter Vacuum Control Block (VCB) is supplied as standard equipment with the Porter Double Mask Scavenger Breathing System (Porter Brown System). The VCB includes two valves which are necessary for control purposes when used with some forms of vacuum source.

When used with the MINISCAV™, both valves should be open fully at all times. Do not use the ON/OFF valve to turn off the vacuum: always use the power switch. The correct positions of the valve controls may be identified from *Fig A* below. *Figs B* and *C* show incorrect positions of the OFF/ON valve. The vacuum limiting valve is fully open when the actuator is in the vertical position, see also *Fig D*.



Fig A valve in ON position



Fig B valve in OFF position



Fig C valve in mid position

The vacuum hose (connecting to the breathing circuit) is fitted to the upper "MASK" spout and the entire assembly is fitted into the MINISCAV™ vacuum inlet by means of the VAC spout (see *Fig D*). These are also identified by the markings on rear of the block.

You should note also that with some Porter vacuum control blocks, the black ball does not rise to the green zone within the indicator tube. In most cases, this does not mean that the MINISCAV™ is not functioning correctly.

As the MINISCAV™ delivers a fixed vacuum that is optimum for scavenging, it is possible to dispense with the vacuum control block and use a simple male-male connector instead (*Fig E*). This enables the vacuum hose to be connected directly to the MINISCAV™ vacuum inlet. Note that this does not provide visual indication of vacuum.

Connection to breathing circuit



Fig D inserted in Miniscav™ vacuum inlet



Fig E a simple connector may be used as an alternative to the VCB

Specifications

Vacuum Pump:	Dual diaphragm type: fixed flow rate, fixed vacuum; synchronous motor
Flow Rate:	42 ±3 lpm
Vacuum:	90 ±10 mmHg
Power Supply:	230V ±10% 50Hz
Power Consumption:	75W (cos θ = 0.75)
Fuse Rating:	T 1A HRC 250V 5x20mm
Protection Class:	Class I (protective earthing)
Ingress Protection:	IP2X; not protected against ingress of liquids or particulate matter
Dimensions:	Width 140mm, Length 415mm, Height 275mm
Weight:	9.25kg

Complies with BS EN 60601-1:2006 (IEC 60601-1:2005)

Environmental Conditions (Operating)

Temperature:	5 to 40 °C
Relative Humidity:	5% to 95% non-condensing
Altitude:	-350m to 3000m

Supplied Accessories

Power lead:	2m, with IEC 60320 C13 appliance coupler and plug appropriate to the territory to which the MINISCAV™ is supplied If a BS 1363 (IS 401) fused 13A plug is used (UK and Ireland), it should be fitted with a 5A fuse
Exhaust transfer hose:	1m, with male 22mm couplers. Other lengths available to order
Vent assembly:	480mm rigid 15mm O.D. tube. Longer lengths available to order; internal elbow connector with female 22mm coupler (for transfer hose); external elbow connector with mesh fauna screen

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