

Hallowell EMC Vacuum / Scavenging Interface

For use in veterinary medical applications only



Operating Manual and Scavenging Primer **With Receiving Information, Installation and Maintenance Instructions**

Hallowell EMC Vacuum/Scavenging Interface

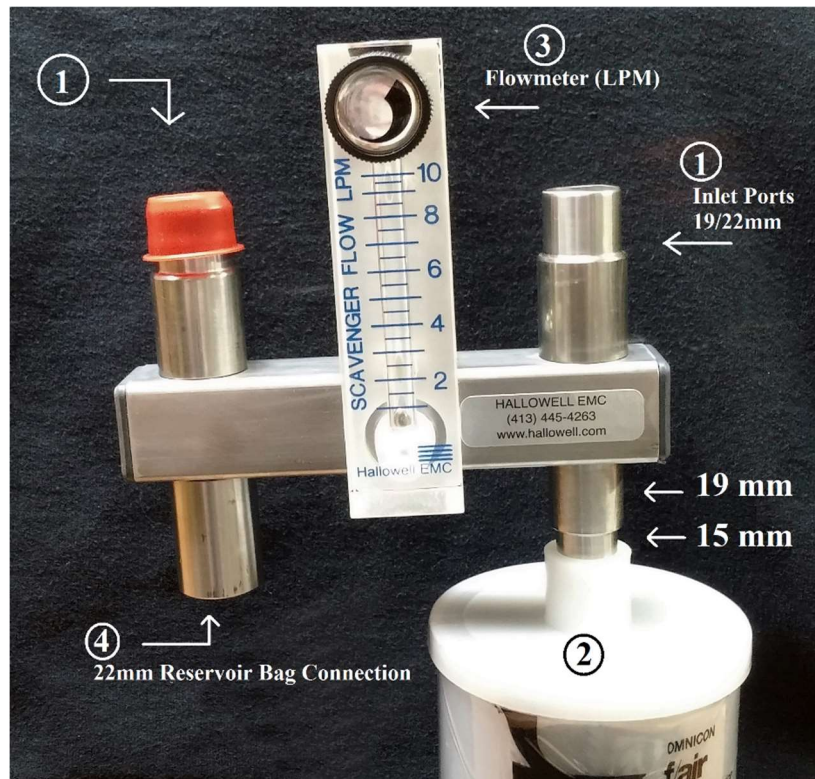
Available Mounting Options

000A5631A – Round/Square Pole Mount
000A5633A – Ceiling Mount

000A5762A – Wall Mount
000A5634A – Wall Outlet Mount

Features of this HEMC interface:

- Two scavenging tube inlet ports (1) that accepts either 19 mm or 22 mm tubing. Optionally the interface can be supplied with three or four inlet ports.
- An integral scavenging backup system in the form of a charcoal canister (2) that scavenges the anesthetics, other than N₂O, from the waste gas in the event of suction system disconnect or failure. This “back up” mode also facilitates transport to other areas of the hospital or can be used where vacuum is not available.
- There are no inlet, outlet or overpressure relief valves to foul, fail or need servicing.
- The scavenging flow rate can be precisely set (3) between 1 and 10 liters per minute and is easily verifiable at any time at a glance from most any angle.
- It is configurable such that it will plug into a wall outlet, hang from a ceiling drop, mount to a square post or pole mount on most any size round pole.
- Durable life lasting aluminum powder coated construction with stainless steel hardware provides MRI compatible as well.



Receiving:

The packing slip you received with this interface lists the part number for this interface. You have received only ONE part completely assembled that is made up of all the additional parts needed to customize its gas connections and mounting options to your needs as discussed when you have placed your order, you received TWO parts only if the hose assembly was required to be separate.

Installation:

Wall Mount, Wall Outlet Mount, and Ceiling Drop Mount Units:



Your interface should be supplied with the type of quick connect (DISS, Ohio, Chemetron, Schrader or Puritan style) fitting you requested at the time your order was taken. The ceiling drop interfaces will have an additional 90° elbow fitting at the top of the flowmeter facilitating the vertical connection to the drop.

Simply plug the interface into either the wall outlet or the ceiling drop.

1. Connect one 19mm or 22mm tube from each device you wish to scavenge onto the inlet ports (1) on the top of the interface. **If an inlet port is not to be used it MUST BE occluded**, a red cap plug is included for this purpose.
2. Be sure the appropriate size reservoir bag is securely attached to the bottom 22 mm connector (4) to the left of the flowmeter. A 2-liter “evacuation purple”, the color standard, bag is included and is appropriate for most applications. One liter and one-half liter bags are also available.
3. Weigh the charcoal canister. Mark the weight in grams on its label along with the date of installation.
4. Attach the canister to the threaded 15 mm port (2) on the bottom side and to the right of the flowmeter.

WARNING: This vacuum/scavenging interface WILL NOT work properly without the charcoal canister, even if the vacuum system is functioning.

Installation: cont.

Round/Square Pole Mount Unit:



1. Your interface includes a clamp to accommodate the size round or square post. Place the interface in the desired position on the pole and tighten the hand tight thumbscrews.

TIGHTEN AS SECURELY AS POSSIBLE.

2. Follow installation steps from page 3.
3. Pole/Square Post mount interface may either have an attached hose or may have a separate hose that needs to be connected to the back of the interface's flowmeter via the quick connect or DISS fitting you requested.

Replaceable Parts List:

<u>Part #</u>	<u>Description</u>
200A3046	Cap, tapered for 19mm tube
240A1466A	Flowmeter, Scavenger flow 1-10 lpm
200A3510	Bag, 2 Liter EVAC Purple Reservoir
240A1450	f/air Canister
DOCA3136B	Operating Manual, Vac/Scav Interface
DOCA4948	HEMC Master Operating Manual CD
000A5642	Custom Hose Assembly

Scavenging Primer:

It has been determined, and regulations require, that waste anesthetic gases must be collected and removed from the premises for health reasons, thus the existence of this device.

Scavenging systems can be classified into two major categories, passive and active systems. A passive system essentially is no more than a hose that directs the flow of waste gasses to a location where it can be safely vented, generally outside a building or into a non-recirculating ventilation system. Systems classified as active can be further grouped into blower in a box (low vacuum) systems or central vacuum systems. Blower-in-a-box systems are just that, they have a blower in a box that blows the gas out of the building. Piping is connected from each device to be “scavenged” into the box. The negative pressure in the piping and box is in the order of magnitude of -2 mmHg. This limits the number and length of drops, connections to machines, which these systems can handle. As will be seen below even this low vacuum pressure will require the use of a scavenging interface of some type. Central vacuum systems generate a much greater negative pressures, around -450 mmHg and can accommodate many drops and long piping runs. These systems can also be used for surgical and tracheal suctioning.

It is for the latter classification of scavenging systems, the central vacuum system, that this interface was designed.

Since in practice breathing systems are generally operated in either an open or semi-open mode they all must have some way to allow the excess fresh gas introduced into the systems to be vented. Otherwise, the pressure within the system, which includes the patient, would continue to increase until something ruptured. That something would probably be the lungs of your patient. Therefore, every breathing system is equipped with some form of automatic pressure limiting (APL) valve also called a pop-off valve the purpose of which is to vent just enough gas from within the system such that the pressure within does not exceed the desired safe level. The pressure at which an APL valve vents the gases is generally adjustable. Actually however APL valves are most often set either fully “open” during spontaneous breathing of the patient or fully closed in order to bag or mechanically ventilate the patient. Fully “open” in the case of APL valves does not mean that there is absolutely no opening pressure or resistance to flow. If this were the case there would effectively be a big hole in the breathing system, its contents would be free to flow out and the breathing bag would not hold enough volume to accommodate the patient’s next breath. Thus every properly operating APL valve has some finite, albeit very low, opening pressure. Ideally this pressure is enough only to keep the breathing bag full and no more. Most APL valves do not permit gas to flow through them until the pressure in the system increases to somewhere between 0.5 and 2 cmH₂O, that is then called its opening pressure. This is not much pressure when you consider that 1 psi is equal to about 70 cmH₂O pressure, which for the discussion below is also about equal to 50 mmHg. Doing the math you can see that 1 cmH₂O is equivalent to 0.014 psi, not much!

Vacuum, suction and or EVAC (evacuation) systems are available in many hospitals today for other purposes such as surgical or tracheal suctioning but the same system can also be used for handling such pollutants as are discharged from anesthesia machines. The negative pressure in these systems however is in the neighborhood of -450 mmHg; this converts to about -630 cmH₂O or -6 psi.

Scavenging Primer: cont.

It can be seen that if you were to connect a negative 630 cmH₂O vacuum source up to an APL valve with an opening pressure of 1 cmH₂O that in most cases, depending on the design of the valve, the valve would be sucked open and it would not take long for the gas in your breathing system, breathing bag and patients lungs to be completely evacuated. Some APL valves are constructed in a manner that will cause them to get sucked closed if too great of a negative pressure is applied to them. This will prevent the breathing system from being drained dry but this also prevents the excess gas from escaping therefore the pressure will continue to rise in the system a rate proportional to the fresh gas flow rate. The problem is similar to what you have seen when someone forgets to open the pop-off valve after bagging the patient a couple of times. The breathing bag eventually becomes over distended and the pressure within causes varying amounts of lung damage until the problem is noticed and the pressure relieved. In either case this is not good for the patient, and there in lies the need for this vacuum/scavenging interface. This is a device that couples two incompatible systems so that they will work with each other.

A properly functioning scavenger interface, as we see above, should allow for the removal of all gases that exit an APL valve without interfering with its delicate operation. The scavenging system cannot apply any negative pressure to the device it is scavenging greater than the opening pressure of that device's APL valve.

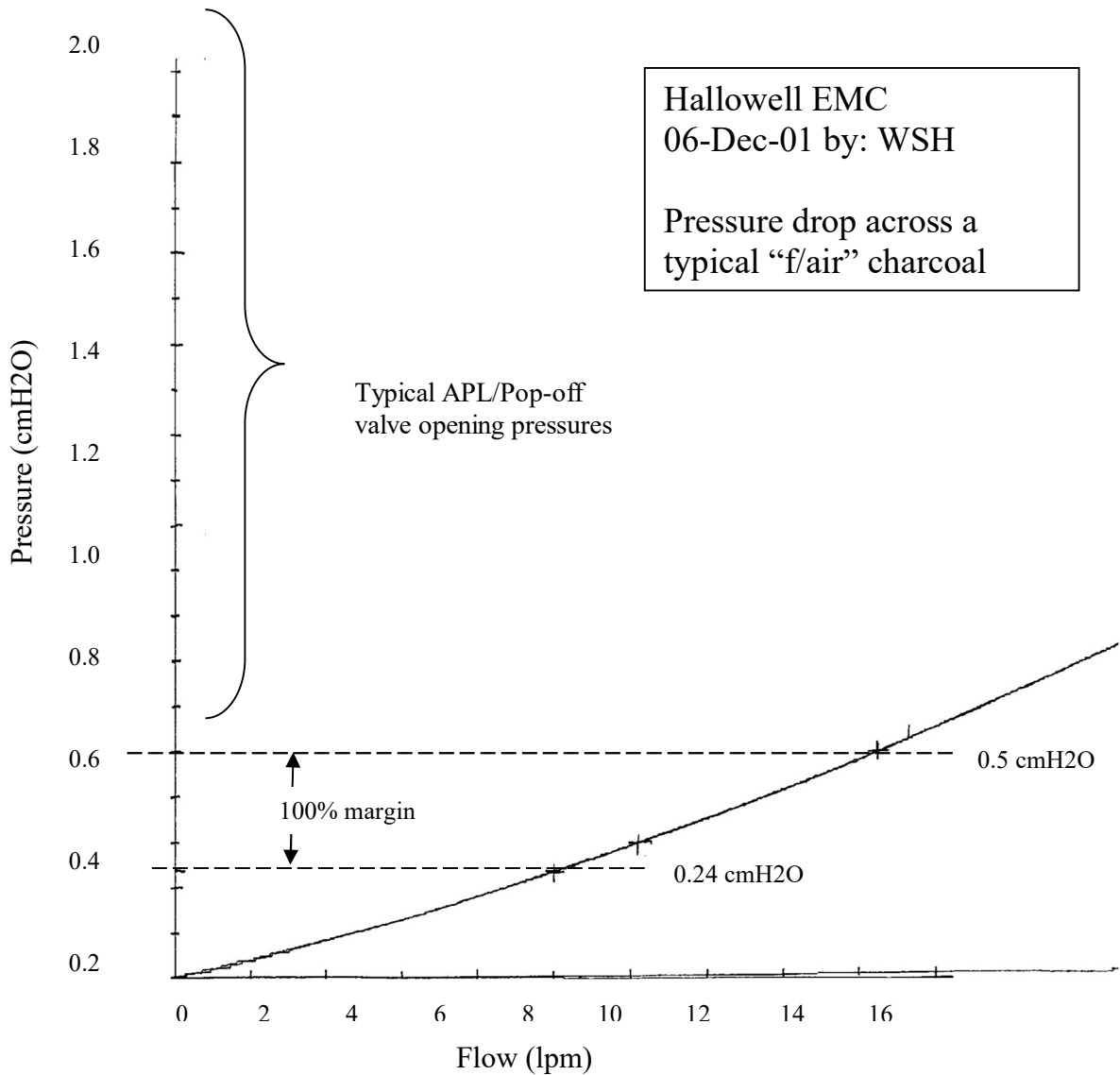
Most scavenging interfaces provide a needle valve to regulate the amount of suction that is applied to the system but no other interface quantify the amount of scavenging flow nor do any permit fine enough adjustment to make this an easy setting.

The Hallowell EMC Vacuum/Scavenging Interface has been designed in such a way that even at high scavenging flows the negative pressure applied to the devices being scavenged never comes close to their opening pressures. See the graph on the next page.

Interface Operation

With the vacuum system running and connected adjust the flowmeter to obtain the desired scavenging flow rate. If you are not sure what flow rate you should be using start with 5 lpm.

The idea is to have the scavenging flow as low as possible so as not to over tax the vacuum system, but high enough to keep up with the average discharge from the devices you are scavenging. The reservoir bag exists to accommodate short periods of high discharge such as when you empty the breathing bag or press the flush button (something I highly recommend avoiding with any “small animal” patient connected).



Interface Operation cont.

Normally during low or moderate flow anesthesia the fresh gas flow rate is set at 2 lpm or much lower. The patient will uptake a portion of that flow and the balance is “popped off” to the scavenger. If you run your anesthesia system with 2 lpm fresh gas flow a scavenging flow of 5 lpm would end up drawing about 3 lpm of room air as well as the average waste gas discharged from the APL valve.

If you are using higher fresh gas flow rates or are frequently emptying the breathing bag and flushing or adjusting the O₂ flowmeter to compensate you may need to set the scavenging flow rate higher. With lower flows it could certainly be set lower.

How appropriate the scavenging flow setting is for the way you operate your anesthesia system can easily be judged by observing the size of the reservoir bag frequently through a few cases. Decrease the flow rate till you see that over the long run the bag never seems to empty completely. Then increase the flow by 50% for a comfortable margin. After you have done this you will find that you will not have to change the setting again given that you continue to operate your anesthesia system in the same manner and that your vacuum level remains the same.

Maintenance:

This interface is made of solid aluminum and is powder coated for durability and easy cleaning. Simply wipe it clean with a damp cloth when required, Get no alcohol on the plastic flowmeter.

The charcoal canister serves a dual purpose in this system. **The system will not function properly without the charcoal canister.** Primarily it provides the slight pressure drop required for trouble free scavenging and filters dust and hair from incoming room air. Far less frequently, when made necessary by a suction system failure or disconnect, flow is reversed through the canister and it absorbs the volatile anesthetics (not N₂O) from the waste gases as they are discharged into the room preventing eventual over distention of the patients lungs. The interface can also be used in this latter “back up” mode during transport or for cases where vacuum is unavailable.

The amount of **dust accumulation** at the bottom of the canister **and its reserve capacity** to absorb more anesthetic **must be checked periodically to insure proper performance** of the system.

Weighing the canister periodically and comparing it to what the canister weighed when it was placed in service (See the Receiving section above) best estimates this reserve capacity. The frequency with which you check the canisters weight depends on your usage but should be done soon after any known suction system failure or disconnect or any transport cases. Be sure to clean off as much dust accumulation as possible from the underside of the filter before weighing it. Before the canister gains 50 grams over the weight recorded when it was put into service (its point of exhaustion) it should be discarded and replaced as recommended by the manufacturer. It is advisable to get into the habit of using the same gram scale to weigh the canisters. Exhausted canisters are to be disposed of as ordinary trash.

As always your comments and feedback on our products are always appreciated.
We can be contacted at 413-445-4263 or info@hallowell.com

We would appreciate it if you would look into some of our other products including:

The Hallowell EMC Model 2002^{Pro} Series of **Veterinary Anesthesia Ventilators** with bellows attachments accommodating patients from 2 to 400 lbs. Maintain normocapnia reducing the risks associated to respiratory acidosis and decreased blood pH levels leading to cardiac complications. This is especially important to your obese patients or those undergoing perineal, perianal or PU surgeries due to their positioning. Smooth out rocky anesthetics, free a pair of hands when you really need them.

The Hallowell EMC **Anesthesia WorkStation** (AWS). This new concept is a complete anesthesia machine (less the vaporizer of your choice) for animals from 150 grams to 6 or 7 kg. It is the same size as the model 2000 but incorporates a heated circle rebreathing system for the patients you previously had to put on a non-rebreathing system. Also incorporated is an integral volume ventilator. Should you want to mechanically ventilate the patient just switch the control from STANDBY to VENTILATE. Now available is a 200ml attachment effectively doubling the maximum deliverable tidal volume (TV) and size of the patient it will accommodate.

The Hallowell EMC **Heated Hard Pads**, literally bullet proof (.22 caliber), are a welcome relief from the so frequent hassles of patching or replacing the flexible heating pads. These solid polycarbonate pads will attach to any existing hot water circulating pump you may have with the provided connectors and still permit you to use your old flexible pads when desired.

The Hallowell EMC lightweight **equine wyes and breathing system tubes**. The wyes are light plastic, will accommodate both Drager and Bivona style metal endotracheal tube connectors as well as the Bivona and Cook funnel fit connectors. They are available with gas sampling ports that draw from within the ET tube. We also have an **equine bronchial-blocker** tube for lung separation applications. The breathing system tubes are also light, clear and easy to clean and dry quickly.

Name: _____

Date: _____

Self-assessment review quiz:

1. What are the general classifications of scavenging systems?
2. Why is scavenging important?
3. What does APL stand for?
4. What conditions could cause the breathing system bag to be drained by a scavenging system, i.e. what pressures would need to be in what relationship to each other?
5. What should a properly operating scavenging system provide for?
6. What observations could you make that would indicate to you that the scavenging flow is inappropriately set? What would you do to correct it?
- 6a. That was easy, what else?
7. What two things should be periodically checked to insure continued proper functioning of this interface? When or how often? How is this done?