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Equipment Company

MULTIPLEX DELIVERY SYSTEM (MDS) PRINCIPLE OF OPERATION AND PARTS LIST



3 STATION MDS PN: AS-01-0529-03
ALSO AVAILABLE AS MDS 4 STATION PN: AS-01-0529-04



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I. Principle of Operation:

- A. The MDS is designed specifically for use with mice and rats using one or more induction chambers and/or one or more non-rebreathing (NRB) systems. The MDS guarantees the proper flow rate to individual inhalant anesthesia stations from one vaporizer. This is accomplished by having a secondary set of flow meters, from 2 to 4, that are placed after the primary flow meter and after the vaporizer.
- B. One of the basic physical laws of inhalant anesthesia systems is that the gases will follow the path of least resistance. What we find with most simple “on / off” type stopcocks controlling the flow of inhalant anesthesia is that there is a disproportionate flow of gases to the various stations.
 - 1. The more stopcocks controlling the flow of gases, the higher the risk of disproportionate distribution of gases. In other words, one station may receive the bulk of the fresh gases, and other stations may not have sufficient flow rate to ensure that the subject receives sufficient fresh gas to remove the exhaled CO₂ within the NRB system. The removal of CO₂ is crucial to the well being of the subject. A build up of CO₂ within the NRB system can result in respiratory acidosis which may cascade into metabolic acidosis. This condition can often result in the death of the subject.



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C. It is recommended that the MDS be used with a 0 - 12 LPM O₂ flow meter (PN: AS-01-0449) for greater than 3 station MDS systems. 3 stations and below can be used with the standard 0 – 4 LPM flow meter PN: AS-01-0450-P.

1. Our recommendation for the O₂ flow rate for an induction chamber is a minimum of 2 LPM. This is done to ensure that the fresh gas flow flushes out the exhaled CO₂ from the induction chamber. It also helps to equilibrate the induction chamber quicker than lower flow rates.

2. Our recommendation for the O₂ flow rate for a NRB system is a minimum of 500cc / minute (for mice) and 1 LPM (for rats).

D. Determining the O₂ flow rate on the primary flow meter is easy. Simply add up the desired total flow rate on the secondary bank of flow meters, and set the primary flow meter to accommodate that total. For example: Let's say an investigator wants to have 3 stations delivering inhalant anesthesia for his mouse study. This would require the use of the 3 Station MDS system. One station is an induction chamber, the other two are NRB systems. The induction chamber would require 2 LPM, the NRB systems would require 500cc / minute each. The total volume would be 3 LPM. The primary flow meter would be set at 3 LPM, the first flow meter of the bank of secondary flow meters would then be set at 2 LPM for the induction chamber, the second flow meter of the bank of secondary flow meters



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would be set at 500cc / minute, and the third flow meter of the secondary flow meters would be set at 500cc / minute. Total volume = 3 LPM.

E. There is a safety valve built into the MDS system that is installed on the primary flow meter. This automatic safety pressure relief valve opens at 6 PSI and releases pure oxygen (not anesthetic) into the workplace. This prevents any damage to the vaporizer, tubing, fittings, and connections. The safety relief valve is an integral part of the MDS system and can be installed on almost any inhalant anesthesia system. There is no danger what so ever with O₂ being released into the environment as long as fire safety considerations are employed. Many inhalant anesthesia systems use activated charcoal filters as the means for Waste Anesthetic Gas (WAG) management. The oxygen from the activated charcoal filters is also released into the environment.

F. As an added benefit, the MDS system is color coded. This means that each fresh gas secondary flow meter, supply line, connectors, and fitting are all color coded such that it is easy to follow the line of fresh gas from the flow meter to the appliance being used to deliver the fresh gas. Our color coding system is unique in the industry; and helps investigators to follow the pathway for fresh inhalant anesthetic delivery. The sequential color coding is red, orange, yellow, green, blue and white.



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1. In addition, our WAG lines are also color coded such that all WAG lines are either purple or blue. Purple is the standard color for WAG conduits in the US. Unfortunately, many manufacturers of the 19mm tubing have not followed this color standard. In some cases, we are forced to use the blue 19mm corrugated tubing for WAG management. Our goal is to follow the purple color code standard whenever possible.

II. Parts:

A. PN: AS-01-0529-HB: Hoke 6 PSI Pressure Relief Valve (provided with each MDS system).

1. Ancillary components of Hoke Assembly:

- a. Hoke Valve PN: Paramount 4310786
- b. ¼" NPT Male X 1/8" NPT Male PN: AA-00-0752
- c. 1/8" NPT Female X Male X Female Street T PN: AA-00-0771
- d. 1/8" NPT Male X 90 degree ¼" Hose Barb PN: AA-00-0924
- e. Compression Ring 0.23 X 0,88 PN: AA-00-0150

2. Each MDS is supplied with a 2 foot length of 3/16" ID silicone tubing PN: AA-00-0482-S with a male 15mm X 6mm non color coded endotracheal tube adapter PN: AA-00-1123 which is fitted to the Common Outlet of the anesthesia system. This Common Outlet is the fresh gas outlet that is beyond the vaporizer.



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3. Each MDS is supplied with an 8" X 3/8's inch stainless steel mounting pin PN: BR-12-0100 for use with Universal Mounting Bracket PN: AA-00-0915 or for placement into the pre-existing 3/8th inch holes at the top of either leg of the PAM.

B. PN AS-01-0529-02 2 Station MDS (color coded red and orange)

1. 1 each color coded red 0 – 2.5 or 5 LPM secondary flow meter for induction chamber. PN: AA-00-0529-96

a. 6 feet color coded red 1/4" ID PVC tubing PN: AA-00-0484-R

b. 1 each color coded red 15mm male X 6mm male endo tube adapter for fresh gas inlet to induction chamber. PN: AA-00-1123.

2. 1 each color coded orange 0 – 1 or 2.5 LPM secondary flow meter for NRB system. PN: AA-00-0529-96

a. 6 feet color coded orange 1/4" ID PVC tubing. PN: AA-00-0484-O.

b. 1 each color coded orange Common Outlet PN: AA-00-0427.

C. PN: AS-01-0529-03 3 Station MDS (color coded red, orange, and yellow).

1. 1 each color coded red 0 – 2.5 or 5 LPM secondary flow meter (see above for part numbers, tubing, and connectors)

2. 1 each color coded orange 0 – 1 or 2.5 LPM secondary flow meter (see above for part number, tubing, and connectors)



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3. 1 each color coded yellow 0 – 1 or 2.5 LPM secondary flow meter
 - a. 6 feet color coded yellow ¼" ID PVC tubing. PN: AA-00-0484-Y
 - b. 1 each color coded yellow Common Outlet. PN: AA-00-0427.
- D. PN: AS-01-0529-04 4 Station MDS (color coded red, orange, yellow and green)
 1. 1 each color coded red 0 – 2.5 or 5 LPM secondary flow meter (see above for part numbers, tubing, and connectors)
 2. 1 each color coded orange 0 – 1 or 2.5 LPM secondary flow meter (see above for part number, tubing, and connectors)
 3. 1 each color coded yellow 0 – 1 2.5 LPM secondary flow meter (see above for part number, tubing and connectors)
 4. 1 each color coded green 0 – 1 or 2.5 LPM secondary flow meter
 - a. 6 feet color coded green ¼" ID PVC tubing. PN: AA-00-0484-
 - b. 1 each color coded green Common Outlet. PN: AA-00-0427.

III. Assembly and Installation Instructions

- A. If the MDS is to be installed on a Summit PAM (Portable Anesthesia Machine), the 3/8" stainless steel pin provided will slip into either of the holes at the top of the PAM legs.
- B. If the MDS is to be installed on any other anesthesia system, a Universal Mounting Bracket is necessary to mount the MDS.
- C. The colored tubing can be cut to length to match the needs of the operator and the position of the appliances used to deliver the inhalant anesthetic. If additional tubing is required, please contact Summit Medical Equipment directly.

If you have any questions and/or concerns regarding the use and/or installation of the MDS, please do not hesitate to contact Summit Medical Equipment.