

A yellow diagonal line is positioned to the left of the Aerogen logo.

Aerogen[®]

Pioneering Aerosol Drug Delivery

Frequently Asked Questions

www.aerogen.com

FAQs

Frequently asked questions are answered below and specifically for each of our products. If you have a question that is not listed, please feel free to contact us directly at marketing@aerogen.com. If you have queries concerning specific drugs and dosages please contact our clinical team:

In US MedicalScience@aerogen.com or Rest of world msl@aerogen.com.

General FAQs:

1. What medications can be used with the Aerogen® Solo, Aerogen® Pro & Aerogen® Ultra?

The Aerogen Solo, Pro and Ultra can nebulize physician-prescribed medications for inhalation which are approved for use with a general purpose nebulizer. For more information on specific drugs and dosages please contact our Clinical team: In US/Canada MedicalScience@aerogen.com or Rest of world msl@aerogen.com

2. Should I adjust the drug dosage when I'm using the Aerogen Solo/Pro?

The Aerogen Solo/Pro can be used to nebulize all physician prescribed drugs approved for use with a general purpose nebulizer. Aerogen Ltd cannot provide specific advice on medication dose as it does not have regulatory approvals for drug/device combinations at this time. Information on drug dosing with specific nebulizers must be sourced from the manufacturer's approved prescribing information for the inhaled formulation, bearing in mind published clinical research examining the efficiency of the different nebulizer technologies in terms of delivering therapeutic/effective drug levels in the lungs for specific medications. Should you require information regarding published clinical research for nebulization of specific medications with Aerogen's devices then please contact our Clinical team directly at medicalsecience@aerogen.com (US)/Canada msl@aerogen.com (Rest of world).

It is recognised that physicians prescribe medications for nebulization that are not approved for use with a general purpose nebulizer based on their perceived clinical need and the risk: benefit ratio for the patient. This is classified as 'off label' use of those products and Aerogen Ltd cannot and does not promote 'off label' use of its devices.

3. Does humidification affect the aerosol drug particles?

Many bench models show increased inhaled dose with dry gas, from pMDI, jet nebulizer, ultrasonic and vibrating mesh nebulizers¹. However, Lin et al., (2009) also showed that if you turn off the humidifier for 30 minutes, the inhaled dose was not increased². Cold dry air can cause bronchospasm, and the majority of drugs given on the ventilator are bronchodilators, so it does not make much sense to turn off the humidifier (creating bronchospasm) to give more bronchodilator³. The biggest risk is forgetting to turn the humidifier back on after the treatment.

4. Is the drug effected if it causes discolouration of the water in a humidifier?

A lot of users have used this configuration and have not reported any problems. Occasionally, there can be a change in the colour of the water in the heated humidifier, for example adrenalin/epinephrine and Ipratropium bromide/salbutamol can turn the water brown. Any medication which rains out in the chamber will not be aerosolized. A study presented at the International Society of Aerosols in Medicine Conference in 2017 investigated the chemical stability of specific drugs after incubation at 50°C for 7 days to mimic a humidifier chamber. All drugs retained their integrity with the exception of acetyl cysteine which had a new peak present in an HPLC chromatogram⁴. If the physician is concerned, they could place the nebulizer at the wye. Please see articles which show deposition rates in these different positions^{1, 5, 6}.

5. What do I do if crystals form in the nebulizer chamber?

If you get crystallization in the nebulizer chamber after use of hypertonic saline, you can aerosolize a few drops of normal saline to clear any residual hypertonic saline and prevent further crystal formation in the solo chamber.

6. What is rain-out and is this aerosolized drug?

Rainout is usually condensation of humidified gas and to a lesser extent aerosolized drug that deposits as droplets within the breathing circuit. Drug in the form of rainout will not be aerosolized and inhaled by the patient.

7. How do you remove residue in the chamber after nebulization of viscous drugs?

In order to remove any residues of viscous drugs you can nebulize a few drops of normal saline.

8. What effect does bias ventilator flow have on aerosol output and deposition?

In vitro studies by Ari et al., (2010) assessing aerosol delivery during mechanical ventilation in the presence of bias flow determined that you receive optimal deposition if you place the nebulizer pre humidifier. In the absence of bias flow optimal deposition was observed when the nebulizer was placed at or close to the wye^{1, 5}. Berlinski & Willis (2013) demonstrated in a pediatric model, that in the presence of bias flow, nebulizers were more effective when placed back at the humidifier as compared to closer to the wye⁶.

9. Where do you place the Aerogen Solo with neonate patients?

As neonatal patients have very small tidal volume its optimal to place the Aerogen Solo at the wye as demonstrated by Berlinski et al. (2016)⁷. However, placement at the humidifier would be acceptable if there are concerns with weight or rainout associated with placement at the wye.

10. Can you use a Heat and Moisture Exchanger (with filter) (HME/HMEf) while delivering aerosol with the Aerogen Solo?

The Aerogen Solo can be used with an HME/HMEf which may contain a filter. Only an HME/HMEf approved for use with a nebulizer should be used. Follow the HME/HMEf manufacturer instructions regarding use with a nebulizer. Ensure the combination of nebulizer, T-piece and HME/HMEf volumes are suitable for the tidal volume being delivered especially with small tidal volumes for example small children.

11. Since the Aerogen nebulizers and ultrasonic nebulizers have pretty similar deposition percentages, what are the advantages/disadvantages?

The main disadvantage of the ultrasonic nebulizers is that heat is generated in the process of producing aerosol, this can break down complex proteins in some of the inhaled medications⁸. In addition, ultrasonic nebulizers are not recommended for administration of suspensions such as Pulmicort (Budesonide)⁸. They show similar aerosol delivery performance in an adult model when placed in the inspiratory limb at the wye and back at the humidifier when there is no bias used¹. In a paediatric model with bias flow, the Aerogen Solo performed better than an ultrasonic when placed on the humidifier, similar deposition was observed at the wye⁶. Both ultrasonic nebulizers and Aerogen have controllers that drive them, but the ultrasonic nebulizer's controller is bigger, bulkier and heavier. The Ultrasonic has a higher residual volume left after nebulization compared to Aerogen which is minimal⁸. The ultrasonic has a reservoir that is positioned below the ventilator circuit whereby contaminated fluids in the circuit can more readily enter the nebulizer⁸.

12. Can you get an effective dose with the Aerogen Solo to a pediatric during HFNC?

Several in vitro studies have evaluated inhaled dose of albuterol/ salbutamol during HFNC. Ari, et al., (2011) assessed aerosol delivery when the Solo was placed inline on the humidifier with HFNC in a pediatric model at 3 and 6 L/min flow⁹. Inhaled dose was improved at 3 L/min and as flow increased dose decreased. In addition, Reminiac et al., (2016) recently published an article assessing aerosol deposition in a toddler simulated breathing model and an animal model of a new born¹⁰. They demonstrated that using the Aerogen Solo inline during HFNC (attached to the humidifier) can provide similar aerosol deposition as using a jet nebulizer independent of the HFNC system. When the jet nebulizer was used with a mask over the HFNC cannula or inline, the results were

minimal. Therefore Aerogen Provides a similar dose to the patient with the added benefit of providing HFNC at the same time.

13. Can you get an effective dose with the Aerogen Solo to an adult patient during HFNC?

The lung dose during HFNC is affected by the flow rate. At lower flow rates, a higher inhaled mass is available. Alcoforado et al., (2016) performed an imaging study that showed that at flow rates of 10-50L/min, between 2-12% lung dose can be achieved whereas 3.76% of the aerosol dose is available at 30L/min¹¹. Flow rate does affect aerosol deposition and lower flow rates will provide higher lung dose. Data from an interim analysis of Reminiac et al. looking at the effect of HFNC with patients with documented airflow obstruction suggested that using the Aerogen Solo in line during HFNC at 30L/min did produce significant bronchodilation similar to using a standard jet nebulizer without HFNC¹².

Aerogen Solo FAQs

1. What brands or models of ventilators can use the Aerogen Solo?

The Aerogen Solo can be used with any brand or model of ventilator. Aerogen technology is integrated in ventilators made by Hamilton Medical, Maquet, Dräger, Resmed, Philips and GE Healthcare.

2. How long does it take to deliver a unit dose?

The flow rate of the Aerogen Solo is > 0.2ml/min with an average of 0.38ml/min. For a standard 3ml dose this would therefore take 7 minute 53 seconds¹³.

3. How much medication is left at the end of a treatment?

Medication left in the nebulizer at the end of the treatment is minimal: < 0.1mL¹³.

4. How much medication can be given at one time?

The medication cup can hold up to 6mL of medication.

5. Can the Aerogen Solo be used with a mouthpiece and an aerosol mask?

Yes, the Aerogen Solo can be connected to the Aerogen Ultra and used with a mouthpiece or aerosol mask (mouthpiece and valved aerosol mask can be provided).

6. How quiet is the Aerogen Solo?

The Aerogen Solo is virtually silent. The noise level is less than 35dB measured at 0.3m distance.

7. How do I clean the Aerogen Solo?

The Aerogen Solo is a single patient use device and can be used for up to 28 days inline on a ventilator circuit based on a typical usage of 4 intermittent treatments per day. For continuous use, the Aerogen Solo is qualified for a maximum of 7 days. Nebulizing a few drops of normal saline can remove any drug residue between doses (which can occur occasionally with viscous drugs). The Aerogen Solo should not be removed from the patient circuit for cleaning.

8. How do you remove residue in the chamber after nebulization of viscous drugs?

In order to remove any residue of viscous drugs, you can nebulize a few drops of normal saline.

9. What medications can the Aerogen Solo deliver?

The Aerogen Solo can nebulize physician-prescribed medications for inhalation which are approved for use with a general purpose nebulizer. For more information on specific drugs and dosages please contact our Clinical team: medicalsecience@aerogen.com (US)/ msl@aerogen.com (Rest of world).

10. Can we use multiple types of drug in the same Aerogen Solo?

You don't need a different Aerogen Solo to nebulize different drugs, but when nebulizing viscous drugs you may need to add a few drops of saline to clear the mesh before nebulizing the next drug. Always refer to the drug manufacturer's guidelines before combining drugs for nebulization.

11. Should I adjust the drug dosage as I'm using the Aerogen Solo?

Aerogen Ltd cannot provide specific advice on medication dose as it does not have regulatory approvals for drug/device combinations at this time. Information on drug dosing with specific nebulizers must be sourced from the manufacturer's approved prescribing information for the inhaled formulation, bearing in mind published clinical research examining the efficiency of the different nebulizer technologies in terms of delivering therapeutic/effective drug levels in the lungs for specific medications. Should you require information regarding published clinical research for nebulization of specific medications with Aerogen's devices then please contact our Clinical team directly at medicalsecience@aerogen.com (US)/Canada msl@aerogen.com (Rest of world).

It is recognised that physicians prescribe medications for nebulization that are not approved for use with a general purpose nebulizer based on their perceived clinical need and the risk: benefit ratio for the patient. This is classified as 'off label' use of those products and Aerogen Ltd cannot and does not promote 'off label' use of its devices.

12. How long can you use the Aerogen Solo?

The Aerogen Solo is a single patient use device and can be used for 28 days based on a typical usage of 4 intermittent treatments per day. For continuous use, the Aerogen Solo is qualified for a maximum of 7 days.

13. How does the lung deposition of drugs with the Aerogen Solo compare to standard nebulizers?

The Aerogen Solo provides 10-15% lung deposition compared to standard jet nebulizer (3%) during mechanical ventilation^{14, 15}. Nearly four times more is delivered with Aerogen during NIV¹⁶. Also, using the Aerogen Ultra, spontaneously breathing subjects showed six times greater deposition compared to jet nebulizers¹⁷.

14. What should I do if the Aerogen Solo stops nebulizing?

Please refer to the trouble shooting guide in the directions for use.

15. How do I get replacement parts?

Contact your local Aerogen Solo Distributor.

16. What should I do if the expiratory filter becomes saturated causing the ventilator to alarm following nebulization?

This can happen on rare occasions. If the Aerogen Solo is positioned near the wye then moving it back to the humidifier will result in less aerosol reaching the expiratory filter (which may resolve the problem) and more drug being delivered to the patient. Occluded filters should be replaced with a new filter and changed according to manufacturer recommendations and as needed.

17. Can Aerogen be sent home with patients?

The Aerogen Solo can be used at home for patient's requiring any type of ventilator support using the Aerogen USB Controller. For spontaneous breathing patients, the InnoSpire Go is available from Philips and utilises the same Aerogen vibrating mesh technology.

18. Can the Aerogen Solo be used during Non-Invasive Ventilation?

Placement of the Aerogen Solo during non-invasive ventilation (BIPAP/CPAP) is improved when the nebulizer is placed between the fixed leak in the circuit and the patient. A bench study by Abdelrahim et al. (2010) demonstrated that aerosol delivery is higher between the leak and the mask. The Aerogen device delivered twice as much aerosol as compared to a standard jet nebulizer¹⁸.

When using non-invasive ventilation with a critical care ventilator (dual limb) you can position the nebulizer on the dry side of the humidifier, at the wye- piece or at the mask. Velasco et al. (2018) reported in a pediatric model that the aerosol dose was significantly higher if the Aerogen Solo was placed at the wye or mask however acceptable levels were still noted at the dry side of the humidifier¹⁹.

Aerogen Ultra FAQs

1. Can both valved & open aerosol masks be used with Aerogen Ultra?

All standard aerosol masks can be connected to the Aerogen Ultra, but a valved mask (included) is best for optimal aerosol deposition²⁰. Use a flow rate of 1-6L/min with an open face mask and do not exceed 2L/min with a pediatric patient. Never use a closed face mask with the Aerogen Ultra.

2. Can a filter be used with the Aerogen Ultra to reduce emission of drugs?

Currently we do not have an approved filter which can be attached to the valved mouthpiece.

3. How do I clean the Aerogen Ultra?

The Aerogen Ultra is a single patient use device which is qualified for 20 intermittent use treatments (at a rate of four doses per day over 5 days) or 3 hours of continuous use. You can remove excess rainout from the Aerogen Ultra periodically (hourly with continuous nebulization). To ensure optimal performance of the Aerogen Ultra remove any residue by rinsing through with sterile water, shake off excess and allow to air dry.

4. How do you remove residue in the nebulization chamber after use of viscous drugs?

In order to remove any residues of viscous drugs you can nebulize a few drops of normal saline.

5. How long can I use the Aerogen Ultra?

The Aerogen Ultra is a single patient use device which is qualified for 20 intermittent use treatments (at a rate of four doses per day over 5 days) or 3 hours of continuous use.

6. What medications can the Aerogen Solo/ Ultra deliver?

The Aerogen Solo with Ultra can nebulize physician-prescribed medications for inhalation which are approved for use with a general purpose nebulizer. For more information on specific drugs and dosages please contact our Clinical team: In US/Canada: MedicalScience@aerogen.com or Rest of world: msl@aerogen.com

7. Can we use multiple types of drug in the same Aerogen Solo?

You don't need a different Aerogen Solo to nebulize different drugs but when nebulizing viscous drugs you may need to add a few drops of saline to clear the mesh before nebulizing the next drug. Always refer to the drug manufacturer's guidelines before combining drugs for nebulization.

8. Should I adjust the drug dosage as I'm using the Aerogen Ultra?

The Aerogen Ultra can be used to nebulize all physician prescribed drugs approved for use with a general purpose nebulizer. Aerogen Ltd cannot provide specific advice on medication dose as it does not have regulatory approvals for drug/device combinations at this time. Information on drug dosing with specific nebulizers must be sourced from the manufacturer's approved prescribing information for the inhaled formulation, bearing in mind published clinical research examining the efficiency of the different nebulizer technologies in terms of delivering therapeutic/effective drug levels in the lungs for specific medications. Should you require information regarding published clinical research for nebulization of specific medications with Aerogen's devices then please contact our Clinical team directly at medicalsecience@aerogen.com (US)/ Canada msl@aerogen.com (Rest of world).

It is recognised that physicians prescribe medications for nebulization that are not approved for use with a general purpose nebulizer based on their perceived clinical need and the risk: benefit ratio for the patient. This is classified as 'off label' use of those products and Aerogen Ltd cannot and does not promote 'off label' use of its devices.

9. How long does it take to deliver a unit dose?

The flow rate of the Aerogen Solo used with the Ultra is > 0.2ml/min with an average of 0.38ml/min. For a standard 3ml dose this would therefore take 7 minute 53 seconds¹³.

10. How much medication is left at the end of a treatment?

Medication left in the nebulizer at the end of the treatment is minimal: < 0.1mL¹³.

11. How much medication can be given at one time?

The medication cup of the Aerogen Solo nebulizer used with the Aerogen Ultra can hold up to 6mL of medication.

12. How does the lung deposition of drugs with the Aerogen Ultra compare to standard nebulizers?

Spontaneously breathing subjects showed six times greater deposition with the Aerogen Ultra compared to jet nebulizers¹⁷.

13. What evidence is available for why a valved mask as compared to a non-valved aerosol mask is optimal for use with the Ultra?

Ari et al., (2015) have shown that a valved mask will provide optimal aerosol dose to the patient compared to a standard open face mask. The aerosol dose is significantly improved with the valved facemask and also it is comparable to mouthpiece (comparison at 2L/min flow)²⁰.

Aerogen Continuous Nebulization Tube Set (CNTS) FAQs

1. How do I setup the CNTS with an infusion pump?

Insert the syringe filled with medication into the syringe infusion pump and set the appropriate flow rate (refer to pump manual or manufacturer for guidance). To ensure correct and safe connection between the nebulizer and the medication reservoir, trace the medication tube from the nebulizer back to the medication reservoir to make sure the medication tube is connected to the correct source.

2. What syringe pump software should you use with the CNTS?

The recommended syringe pump software setting with the Aerogen syringe is typically the “BD Plastipak” setting. This must be validated locally before use. Refer to pump manual or manufacturer for guidance. These pumps should also be used in accordance with local hospital or ward policies.

3. What flow rate should I use with the CNTS

Aerogen’s recommended input rate of medication into the Aerogen Solo nebulizer during continuous nebulization is up to a maximum of 12 mL per hour. The upper limit of 12 mL per hour is based on Aerogen’s specification for the minimum nebulizer flow rate and should not be exceeded.

4. How does volumetric dosing work with CNTS?

The CNTS drops the medication onto the vibrating mesh continuously. The rate of drug entering the nebulizer determines the drug output rate. This gives you the ability to titrate medication utilizing the infusion rate of the pump. There is no need to change the concentration of the medication in the syringe.

If the infusion rate is low you might see pauses between aerosol being generated, however this is a normal finding at low rates and there is no reason for concern.

Example of volumetric dosing: 25mg/hour dose:

Problem: What infusion rate do I use to deliver 25 mg per hour of albuterol/ salbutamol (0.5% solution-5mg/ml)?
What is the output of the solo for a 25 mg per hour dose of albuterol/ salbutamol?

$$\text{Infusion rate pump} = \text{Solo output} = \frac{\text{Desired Dosage (mg/hour)}}{5 \text{ mg /ml}}$$

$$\text{Solo output} = \frac{25 \text{ mg per hour}}{5 \text{ mg /ml}} = 5 \text{ ml per hour}$$

Answer: To deliver 25 mg per hour with undiluted 0.5% albuterol/ salbutamol, set the infusion pump rate to 5 ml per hour. The pump rate is the output of the Solo.

5. Why is the fluid level in the aerosol chamber rising?

Rising fluid level in the aerosol chamber indicates that the fill rate has exceeded the nebulization rate of the Solo. The recommended input rate of medication into the Aerogen Solo nebulizer during continuous nebulization is up to a maximum of 12 mL per hour and should not be exceeded.

6. How do I fill the Aerogen Syringe?

Use another syringe to draw up the medication with a needle or needleless connector and with the plunger pulled back on the Aerogen syringe insert the medication through the cap end of the Aerogen syringe.

7. Are pauses in aerosol normal with volumetric dosing?

Yes. Medication is delivered drop by drop with volumetric dosing. When solution drops on to the aperture plate aerosol is produced. There will be a pause in aerosol in between drops. The hourly output of the Solo will be based on the rate set on the infusion pump.

8. What is the priming volume of the CNTS tubing?

You should prime the tubing until the medication reaches the end of the tubing. The tubing priming volume is maximum 3.65 mL. Rising level of medication in the reservoir may occur if the Aerogen Solo nebulizer is turned off while the feed system is still on or the nebulizer is not in its recommended orientation.

Aerogen Pro FAQs

1. How do I clean the Aerogen Pro?

The Aerogen Pro can be cleaned, disinfected, and sterilized. Always clean, disinfect or sterilize in accordance with the current hospital protocols. Please see the Aerogen Pro Instruction manual for more information²¹.

2. How long can I use the Aerogen Pro?

The Aerogen Pro system is designed to be reusable and the nebulizer is expected to last for approximately 1 year of a typical usage of 4 treatments per day and one sterilization per week where the device is assumed to be used for 50% of the time. Refer to your local distributor regarding warranty details.

3. How do you remove residue in the chamber after nebulization of viscous drugs?

In order to remove any residues of viscous drugs you can nebulize a few drops of saline.

4. What brands or models of ventilators can use the Aerogen Pro?

The Aerogen Pro can be used with any brand or model of ventilator.

5. How much medication is left at the end of a treatment?

Medication left in the nebulizer at the end of the treatment is minimal: < 0.1mL²¹.

6. How much medication can be given at one time?

The medication cup can hold up to 10mL of medication.

7. How long does it take to deliver a unit dose?

The flow rate of the Aerogen Pro is > 0.2ml/min with an average of 0.4ml/min. For a standard 3ml dose this would therefore take 7 minute 30 seconds²¹

8. What medications can the Aerogen Pro deliver?

The Aerogen Pro can nebulize physician-prescribed medications for inhalation which are approved for use with a general purpose nebulizer. For more information on specific drugs and dosages please contact our Clinical team: In US/Canada: MedicalScience@aerogen.com or Rest of world: msl@aerogen.com.

9. Can we use multiple types of drug in the same Aerogen Pro?

You don't need a different Aerogen Pro to nebulize different drugs but when nebulizing viscous drugs you may need to add a few drops of saline to clear the mesh before nebulizing the next drug. Always refer to the drug manufacturer's guidelines before combining drugs for nebulization.

10. Should I adjust the drug dosage as I'm using the Aerogen Pro?

The Aerogen Pro can be used to nebulize all physician prescribed drugs approved for use with a general purpose nebulizer. Aerogen Ltd cannot provide specific advice on medication dose as it does not have regulatory approvals for drug/device combinations at this time. Information on drug dosing with specific nebulizers must be sourced from the manufacturer's approved prescribing information for the inhaled formulation, bearing in mind published clinical research examining the efficiency of the different nebulizer technologies in terms of delivering therapeutic/effective drug levels in the lungs for specific medications. Should you require information regarding published clinical research for nebulization of specific medications with Aerogen's devices then please contact our Clinical team directly at medicalscience@aerogen.com (US)/Canada msl@aerogen.com (Rest of world).

It is recognised that physicians prescribe medications for nebulization that are not approved for use with a general purpose nebulizer based on their perceived clinical need and the risk: benefit ratio for the patient. This is classified as 'off label' use of those products and Aerogen Ltd cannot and does not promote 'off label' use of its devices.

11. Can the Aerogen Pro be used with a mouthpiece or aerosol mask?

Yes, the Aerogen Pro can be connected to a mouthpiece using the adult T-piece. An aerosol mask can be connected by using the vented elbow and face mask elbow which are provided in the Aerogen Pro mask kit. Masks and mouthpieces are not included.

12. How quiet is the Aerogen Pro?

The Aerogen Pro is virtually silent. The noise level is less than 35dB measured at 0.3m distance.

13. How does the efficiency of nebulization of drugs with the Aerogen Pro compare to standard nebulizers?

The Aerogen Pro provides improved drug dose compared to standard jet nebulizer during mechanical ventilation¹ and NIV¹⁸.

14. How do I get replacement parts?

Contact your local Aerogen Pro Distributor.

Controller FAQs:

Table 1: Aerogen Pro-X Controller Troubleshooting /

If this happens:	It could mean:	Try this:
The 30 Min. indicator flashes during nebulization.	Battery power is low.	Recharge battery (see Recharging the Battery).
Battery will not recharge. Controller is connected to the AC/DC adapter and the battery charging light is illuminated green and the 30 Min. indicator light is flashing.	It may be time to replace the battery.	Contact your local Aerogen sales representative.
Battery will not retain initial charge.	Rechargeable battery may need to be replaced.	Contact your local Aerogen sales representative.
The 30 Min. or Continuous light illuminates, but aerosol is not visible.	No medication in nebulizer.	Refill medication through filler cap in the nebulizer (see page 17).
	It may be time to replace the nebulizer.	See Warranty and Life of Product. Refer to Aerogen Solo parts list by visiting www.aerogen.com .
30 Min. or Continuous indicator does not light when On/Off power button is pressed.	There is no power to the system.	Verify that AC/DC adapter is securely attached to controller.
	Rechargeable battery is depleted.	Recharge battery (see Recharging the Battery).
The fault indicator light illuminates.	The controller cable is incorrectly connected to the nebulizer, or electronics are malfunctioning.	Verify that controller cable is correctly connected to both the nebulizer and the controller.
Medication is left in the nebulizer after nebulization cycle.	Nebulizer was not turned on or connected to power.	Ensure that nebulizer is connected to power and turned on.
	Rechargeable battery is depleted.	Recharge battery (see Recharging the Battery).
	A 30 Minute cycle was selected when connected to the continuous feed system.	Run a continuous cycle.
	It may be time to replace the nebulizer.	See Warranty and Life of Product. Refer to Aerogen Solo parts list by visiting www.aerogen.com .
Flashing amber light.	It may mean that it is time to replace controller.	Contact your local Aerogen sales representative.

Aerogen USB Controller FAQ's ²²

How can the Aerogen USB Controller be used with Aerogen nebulizers?

The Aerogen USB Controller can be used with Aerogen nebulizers as follows

Table 2: USB Intended Use Summary /

Intended Use Summary	Aerogen Solo Nebulizer	Aerogen Pro Nebulizer
Hospital - Ventilated patients	✓	✓
Hospital -Spontaneously Breathing Patients	✓	✓
Homecare - Ventilated patients	✓	✓
Homecare - Spontaneously Breathing Patient	✗	✗
30 Minute Mode Operation	✓	✓
6 Hour Mode Operation	✓	✗

Table 3: Aerogen USB Controller System Troubleshooting /

If this happens:	It could mean:	Try this:
The 30 Minute or 6 Hour indicator light is green, but aerosol is not visible.	No medication in nebulizer.	Refill medication.
	Aerogen Pro has not been properly cleaned.	Clean Aerogen Pro.
	Nebulizer used beyond life of product.	See Warranty and Life of Product.
The 30 Minute or 6 Hour indicator does not light when On/Off power button is pressed.	There is no power to the system.	Verify Aerogen USB Controller is securely attached to a functioning power source.
		Verify green power indicator light on AC/DC is on (if using Aerogen USB Controller AC/ DC Adapter).
The 30 Minute or 6 Hour indicator lights amber.	The Aerogen USB Controller cable is incorrectly connected.	Verify the Aerogen USB Controller cable is correctly connected to the nebulizer.
	Nebulizer used beyond life of product.	See Warranty and Life of Product.
Longer than expected treatment time e.g. 6 mL of Normal Saline (0.9%) should take no longer than 30 minutes to nebulize.	Aerogen Pro has not been properly cleaned.	Clean the Aerogen Pro.
	The nebulizer used beyond life of product.	See Warranty and Life of Product.
Medication is left in the nebulizer after nebulization cycle.	Nebulizer was not turned on or connected to power.	Ensure that the nebulizer is connected to power and turned on.
	Aerogen Pro has not been properly cleaned.	Clean the Aerogen Pro.
	Aerosol was not generated.	Verify aerosol is visible.
	It may be time to replace the nebulizer.	See Warranty and Life of Product.
The 30 Minute and 6 Hour indicators flash amber alternatively twice.	Internal error condition.	See Warranty and Life of Product.

Aerogen Pro Controller FAQ's ²¹

Table 4: Aerogen Pro Troubleshooting /

If this happens:	It could mean:	Try this:
The 15 Min. or 30 Min. indicator flashes during nebulization.	Battery power is low.	Recharge battery (see Recharging the Battery).
Battery will not recharge. Constant green light showing on the battery status indicator and flashing green light on either the 15 Min. or 30 Min. indicator light, when the controller is connected to the AC/DC Adapter.	It may be time to replace the battery.	Contact your local Aerogen sales representative.
Battery will not retain initial charge.	Rechargeable battery may need to be replaced.	Contact your local Aerogen sales representative.
The 15 Min. or 30 Min. light illuminates, but aerosol is not visible.	No medication in nebulizer.	Refill medication through filler cap in the nebulizer (see page 15).
	Nebulizer has not been cleaned properly.	Clean nebulizer (see page 20)
	It may be time to replace the nebulizer.	See Warranty and Life of Product. Refer to Aerogen Pro parts list by visiting www.aerogen.com .
15 Min. or 30 Min. indicator does not light when On/Off power button is pressed.	There is no power to the system.	Verify that AC/DC adapter is securely attached to controller.
	Rechargeable battery is depleted.	Recharge battery (see Recharging the Battery).
The fault indicator light illuminates.	The controller cable is incorrectly connected to the nebulizer, or electronics are malfunctioning.	Verify that controller cable is correctly connected to both the nebulizer and the controller.
Longer than expected treatment time. e.g. 3 mL of Normal Saline (0.9%) should take no longer than 15 minutes to nebulize.	Rechargeable battery is depleted.	Recharge battery (see Recharging the Battery).
	Nebulizer has not been properly cleaned.	Clean nebulizer (see page 20).
	It may be time to replace the nebulizer.	See Warranty and Life of Product. Refer to Aerogen Pro parts list by visiting www.aerogen.com .
Medication is left in the nebulizer after nebulization cycle.	Nebulizer was not turned on or connected to power.	Ensure that nebulizer is connected to power and turned on.
	Rechargeable battery is depleted.	Recharge battery (see Recharging the Battery).
	Nebulizer has not been properly cleaned.	Clean nebulizer (see page 20).
	A 15 Minute cycle was selected and a volume greater than 3 mL was added to the nebulizer.	Run an additional 15 Minute cycle. When delivering a dose greater than 3 mL select the 30 Minute cycle.
	It may be time to replace the nebulizer.	See Warranty and Life of Product. Refer to Aerogen Pro parts list by visiting www.aerogen.com .

References

1. Ari A, Areabi H and Fink JB. Evaluation of aerosol generator devices at 3 locations in humidified and non-humidified circuits during adult mechanical ventilation. *Respiratory care*. 2010;55:837-44.
2. Lin HL, Fink JB, Zhou Y and Cheng YS. Influence of moisture accumulation in inline spacer on delivery of aerosol using metered-dose inhaler during mechanical ventilation. *Respiratory care*. 2009;54:1336-41.
3. Kaminsky DA, Bates JH and Irvin CG. Effects of cool, dry air stimulation on peripheral lung mechanics in asthma. *American journal of respiratory and critical care medicine*. 2000;162:179-86.
4. Saeed H, Abdelrahim ME and Fink JB. The effect of heat and humidification on commonly nebulized drugs. Poster presentation at ISAM. 2017.
5. Ari A, Atalay OT, Harwood R, Sheard MM, Aljamhan EA and Fink JB. Influence of nebulizer type, position, and bias flow on aerosol drug delivery in simulated pediatric and adult lung models during mechanical ventilation. *Respiratory care*. 2010;55:845-51.
6. Berlinski A and Willis JR. Albuterol delivery by 4 different nebulizers placed in 4 different positions in a pediatric ventilator in vitro model. *Respiratory care*. 2013;58:1124-33.
7. Berlinski A and Kumaran S. Particle Size Characterization of Nebulized Albuterol Delivered by a Vibrating Mesh Nebulizer Through Pediatric Endotracheal Tubes. Poster Presentation at ATS. 2016.
8. Ari A and Fink JB. Aerosol Drug Delivery During Mechanical Ventilation: Devices, Selection, Delivery Technique, and Evaluation of Clinical Response to Therapy. *Clinical Pulmonary Medicine*. 2015;22:79-86.
9. Ari A, Harwood R, Sheard M, Dailey P and Fink JB. In vitro comparison of heliox and oxygen in aerosol delivery using pediatric high flow nasal cannula. *Pediatric pulmonology*. 2011;46:795-801.
10. Reminiac F, Vecellio L, Loughlin RM, Le Pennec D, Cabrera M, Vourc'h NH, Fink JB and Ehrmann S. Nasal high flow nebulization in infants and toddlers: An in vitro and in vivo scintigraphic study. *Pediatric pulmonology*. 2016.
11. Alcoforado L, Ari A, De Melo Barcelar J, Brandao SS, Fink JB and Dornelas De Andrade A. Comparison of Aerosol Deposition with Heated and Unheated High Flow Nasal Cannula (HFNC) in Healthy Adults. Poster presentation at ATS. 2016.
12. Reminiac F, Gissot V, Vecellio L, Plantier L and Ehrmann S. Nebulization during nasal high flow therapy: Interim results of a randomized clinical trial. Poster Presentation at International Society of Aerosols in Medicine. 2017.
13. Aerogen Solo System Instruction manual Aerogen Ltd. Part No. AG-AS3050 P/N 30-354
14. MacIntyre NR, Silver RM, Miller CW, Schuler F and Coleman RE. Aerosol delivery in intubated, mechanically ventilated patients. *Critical care medicine*. 1985;13:81-4.
15. Dugernier J, Reychler G, Wittebole X, Roeseler J, Depoortere V, Sottiaux T, Michotte JB, Vanbever R, Dugernier T, Goffette P, Docquier MA, Raftopoulos C, Hantson P, Jamar F and Laterre PF. Aerosol delivery with two ventilation modes during mechanical ventilation: a randomized study. *Annals of intensive care*. 2016;6:73.
16. Galindo-Filho VC, Ramos ME, Rattes CS, Barbosa AK, Brandão DC, Brandão SCS, Fink JB and Dornelas de Andrade A. Radioaerosol Pulmonary Deposition Using Mesh and Jet Nebulizers During Noninvasive Ventilation in Healthy Subjects. *Respiratory care*. 2015;60:1238-1246.
17. Dugernier J, Hesse M, Vanbever R, Depoortere V, Roeseler J, Michotte JB, Laterre PF, Jamar F and Reychler G. SPECT-CT Comparison of Lung Deposition using a System combining a Vibrating-mesh Nebulizer with a Valved Holding Chamber and a Conventional Jet Nebulizer: a Randomized Cross-over Study. *Pharmaceutical research*. 2017;34:290-300.
18. Abdelrahim ME, Plant P and Chrystyn H. In-vitro characterisation of the nebulized dose during non-invasive ventilation. *The Journal of pharmacy and pharmacology*. 2010;62:966-72.
19. Velasco J and Berlinski A. Albuterol Delivery Efficiency in a Pediatric Model of Noninvasive Ventilation With Double-Limb Circuit. *Respiratory care*. 2018;63:141-146.
20. Ari A, de Andrade AD, Sheard M, AlHamad B and Fink JB. Performance Comparisons of Jet and Mesh Nebulizers Using Different Interfaces in Simulated Spontaneously Breathing Adults and Children. *Journal of aerosol medicine and pulmonary drug delivery*. 2015;28:281-9.

21. Aerogen Pro System Instruction Manual. Aerogen Ltd. Part No. AG-AP1080 P/N 30-040
22. Aerogen USB Controller System Instruction Manual. Part no. AG-UC1050 P/N 30-763.

PM505

Galway Business Park,
Dangan
Galway
+353 91 540 400

www.aerogen.com