

# MiniSpacer® Dual-Spray Inline MDI Adapters

## MINISPACER Adapter Particle Size and Dosing Characteristics



The MiniSpacer® MDI adapter was evaluated for particle size and dosing characteristics using an 8 stage cascade impactor. The MINISPACER was connected to the cascade impactor with ventilator tubing, wye and an endotracheal (ET) tube as they would be used in a ventilator circuit. Air was drawn through the assembly at a flow rate of 28.3 l/min. The aerosol samples exited the ET tube into the cascade impactor and comprised the Total Delivered Dose.

1543

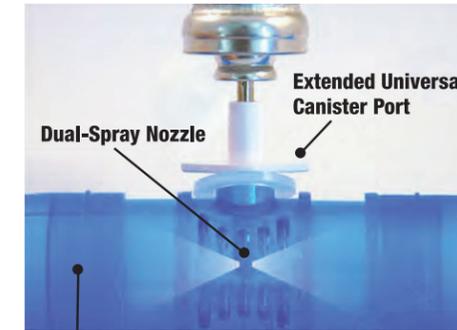
Drug Tested	REF 1543 – Installed between the wye and ET tube of a 22mm circuit			REF 1543 – Installed at the wye in the inspiratory limb of a 15mm circuit			
	Ventolin** HFA	Atrovent** HFA	QVAR** 80	Ventolin** HFA	Atrovent** HFA	QVAR** 80	
Labeled Metered Dose per Actuation (µg from valve)	120	21	100	120	21	100	
Particle Size (MMAD) µm ± SD Range of Measurements	2.22 +/- 0.08 2.16 – 2.31	0.87 +/- 0.15 0.78 – 1.05	0.86 +/- 0.03 0.83 – 0.88	2.26 +/- 0.06 2.20 – 2.30	0.86 +/- 0.17 0.76 – 1.06	0.94 +/- 0.03 0.91 – 0.96	
Geometric Standard Deviation µm ± SD Range of Measurements	1.55 +/- 0.02 1.53 – 1.57	1.90 +/- 0.12 1.82 – 2.04	1.71 +/- 0.01 1.70 – 1.72	1.55 +/- 0.04 1.53 – 1.60	1.86 +/- 0.17 1.74 – 2.06	1.70 +/- 0.02 1.69 – 1.72	
Total Delivered Dose µg ± SD Range of Measurements	18.0 +/- 1.06 16.8 – 18.8	1.58 +/- 0.45 1.23 – 2.09	14.3 +/- 2.5 12.3 – 17.1	20.9 +/- 3.8 17.0 – 24.6	1.79 +/- 0.18 1.69 – 2.00	13.5 +/- 0.8 12.6 – 14.2	
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements	17.3 +/- 0.8 16.3 – 17.8	1.52 +/- 0.39 1.21 – 1.97	14.3 +/- 2.5 12.3 – 17.1	20.0 +/- 4.3 15.5 – 24.1	1.73 +/- 0.11 1.65 – 1.86	13.5 +/- 0.8 12.6 – 14.2	
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements	14.4 +/- 0.7 13.6 – 14.8	7.28 +/- 1.88 5.78 – 9.40	14.3 +/- 2.5 12.3 – 17.1	16.7 +/- 3.6 12.9 – 20.1	8.24 +/- 0.53 7.87 – 8.85	13.5 +/- 0.8 12.6 – 14.2	
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	6.68%	4.96 %	0.12 %	7.13 %	5.41 %	0.00 %
	Fine Particles (1.1 - 4.7 µm)	83.14%	17.29 %	23.94 %	84.13 %	16.39 %	29.77 %
	Extra-Fine Particles (< 1.1 µm)	10.18 %	77.75 %	75.94 %	8.74 %	78.20 %	70.23 %



1543A

Drug Tested	REF 1543A – Installed between the wye and ET tube of a 22mm circuit			REF 1543A – Installed at the wye in the inspiratory limb of a 15mm circuit			
	Ventolin** HFA	Atrovent** HFA	QVAR** 80	Ventolin** HFA	Atrovent** HFA	QVAR** 80	
Labeled Metered Dose per Actuation (µg from valve)	120	21	100	120	21	100	
Particle Size (MMAD) µm ± SD Range of Measurements	2.26 +/- 0.07 2.18 – 2.32	0.81 +/- 0.10 0.75 – 0.93	0.90 +/- 0.02 0.89 – 0.93	2.31 +/- 0.05 2.28 – 2.37	0.89 +/- 0.06 0.85 – 0.96	0.98 +/- 0.05 0.92 – 1.03	
Geometric Standard Deviation µm ± SD Range of Measurements	1.56 +/- 0.05 1.51 – 1.61	1.93 +/- 0.11 1.80 – 2.01	1.70 +/- 0.01 1.69 – 1.71	1.55 +/- 0.04 1.53 – 1.60	1.88 +/- 0.14 1.76 – 2.03	1.73 +/- 0.03 1.70 – 1.76	
Total Delivered Dose µg ± SD Range of Measurements	17.5 +/- 4.2 13.8 – 22.0	1.46 +/- 0.29 1.23 – 1.78	14.4 +/- 1.0 13.3 – 15.3	22.3 +/- 1.9 20.2 – 24.0	1.63 +/- 0.42 1.28 – 2.10	14.6 +/- 1.5 13.0 – 16.1	
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements	16.7 +/- 4.0 13.2 – 21.0	1.44 +/- 0.31 1.19 – 1.79	14.4 +/- 1.0 13.3 – 15.3	21.3 +/- 1.9 19.2 – 23.0	1.57 +/- 0.37 1.25 – 1.96	14.6 +/- 1.5 13.0 – 16.1	
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements	13.9 +/- 3.3 11.0 – 17.5	6.86 +/- 1.47 5.65 – 8.50	14.4 +/- 1.0 13.3 – 15.3	17.8 +/- 1.6 16.0 – 19.2	7.47 +/- 1.74 5.94 – 9.35	14.6 +/- 1.5 13.0 – 16.1	
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	7.47 %	3.11 %	0.00 %	5.98 %	5.83 %	0.00 %
	Fine Particles (1.1 - 4.7 µm)	83.37 %	14.68 %	27.03 %	86.61 %	18.13 %	32.59 %
	Extra-Fine Particles (< 1.1 µm)	9.16 %	82.22 %	72.97 %	7.41 %	76.04 %	67.41 %

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Small Size



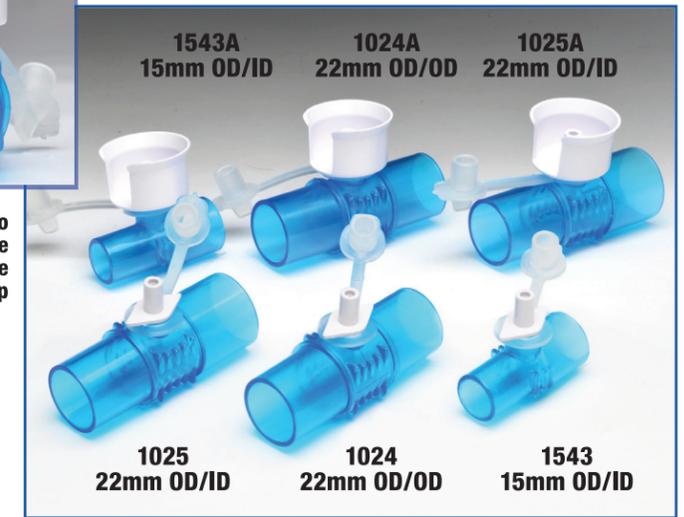
Helps to Minimize Condensate Build-up

- Optimal fit and functionality helps to ensure the safety of the patient
- Designed for safety
- Remains inline between treatments
- Convenient & Disposable
- Single-patient use helps prevent cross-contamination

The MINISPACER® dual-spray MDI Adapter offers an effective and affordable way to administer MDI medication to ventilated patients. With six configurations to choose from, the MINISPACER adapter can be placed in various locations within the patient circuit. The MINISPACER adapter contributes minimal deadspace to the breathing circuit (< 20mL) and the inline configuration does not impede condensate drainage. The MINISPACER adapter performs like a spacer with the cost-effectiveness of an adapter.

Features	Benefits
<b>Dual-Spray Nozzle</b>	Dual-spray orifices direct aerosol plume both upstream and downstream, therefore the aerosol plume develops within a greater area. This exclusive feature increases dose output and reduces drug rainout.
<b>Universal MDI Port</b>	The MINISPACER adapter accepts plastic and metal tipped metered dose inhaler canisters, including canisters with integrated dose counters.
<b>Small Size</b>	The MINISPACER adapter is available in standard 22mm or 15mm sizes, reduces weight on the circuit and minimizes condensate buildup. The MINISPACER adapter is an economical alternative to larger, more costly spacers.
<b>Standard Connections</b>	The MINISPACER connectors conform to the international standard ISO 5356-1, helping to ensure compatibility with other devices and security of circuit connections.
<b>Biocompatible Materials</b>	To meet Thayer Medical's stringent safety requirements, the MINISPACER adapter has been tested for biocompatibility. The MINISPACER adapters are not made with natural rubber latex.

- MINISPACER adapters are compatible with most MDI canisters with or without dose-counting mechanisms.
- MINISPACER A adapters are designed to increment the dose-counting mechanism on some MDI canisters.



REF	Description (Sold in cases of 50)
1024	MINISPACER® Dual-Spray MDI Adapter 22mm OD/OD
1025	MINISPACER® Dual-Spray MDI Adapter 22mm OD/ID
1543	MINISPACER® Dual-Spray MDI Adapter 15mm OD/ID
1024A	MINISPACER® Dual-Spray MDI Adapter 22mm OD/OD with counter incrementing actuator
1025A	MINISPACER® Dual-Spray MDI Adapter 22mm OD/ID with counter incrementing actuator
1543A	MINISPACER® Dual-Spray MDI Adapter 15mm OD/ID with counter incrementing actuator



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(U.S.) Federal law restricts this device to sale by or on the order of a licensed healthcare practitioner.

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US Patent No. 5,474,058 PUB0100 Rev F

## MINISPACER Adapter Particle Size and Dosing Characteristics



The MiniSpacer® MDI adapter was evaluated for particle size and dosing characteristics using an 8 stage cascade impactor. The MINISPACER was connected to the cascade impactor with ventilator tubing, wye and an endotracheal (ET) tube as they would be used in a ventilator circuit. Air was drawn through the assembly at a flow rate of 28.3 l/min. The aerosol samples exited the ET tube into the cascade impactor and comprised the Total Delivered Dose.

1024

Drug Tested		REF 1024 22mm OD / OD Installed 6" upstream of the wye in the inspiratory limb of a 22mm circuit		
		Ventolin** HFA	Atrovent** HFA	QVAR** 80
Labeled Metered Dose per Actuation (µg from valve)		120	21	100
Particle Size (MMAD) µm ± SD Range of Measurements		2.19 +/- 0.11 2.08 – 2.30	0.92 +/- 0.06 0.88 – 0.99	1.18 +/- 0.11 1.11 – 1.30
Geometric Standard Deviation µm ± SD Range of Measurements		1.53 +/- 0.06 1.49 – 1.60	1.74 +/- 0.03 1.71 – 1.78	1.58 +/- 0.03 1.56 – 1.61
Total Delivered Dose µg ± SD Range of Measurements		27.4 +/- 5.4 21.2 – 30.8	2.82 +/- 0.52 2.30 – 3.34	20.6 +/- 3.3 17.2 – 23.7
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements		26.6 +/- 5.2 20.8 – 30.0	2.77 +/- 0.46 2.29 – 3.23	20.6 +/- 3.4 17.0 – 23.7
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements		22.2 +/- 4.3 17.3 – 24.8	13.2 +/- 2.2 10.9 – 15.4	20.6 +/- 3.4 17.0 – 23.7
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	4.18 %	2.90 %	0.34 %
	Fine Particles (1.1 - 4.7 µm)	88.34 %	24.38 %	45.26 %
	Extra-Fine Particles (< 1.1 µm)	7.48 %	72.72 %	54.40 %

## MINISPACER Adapter Particle Size and Dosing Characteristics



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1025

Drug Tested		REF 1025 22mm OD / ID Installed at the patient wye in the inspiratory limb of a 22mm circuit		
		Ventolin** HFA	Atrovent** HFA	QVAR** 80
Labeled Metered Dose per Actuation (µg from valve)		120	21	100
Particle Size (MMAD) µm ± SD Range of Measurements		2.30 +/- 0.06 2.24 – 2.36	0.83 +/- 0.05 0.78 – 0.89	1.05 +/- 0.07 1.00 – 1.12
Geometric Standard Deviation µm ± SD Range of Measurements		1.48 +/- 0.02 1.46 – 1.50	1.72 +/- 0.06 1.68 – 1.79	1.66 +/- 0.11 1.53 – 1.74
Total Delivered Dose µg ± SD Range of Measurements		30.7 +/- 2.4 28.0 – 32.4	2.25 +/- 0.66 1.82 – 3.00	21.9 +/- 3.5 18.1 – 24.9
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements		29.8 +/- 2.3 27.1 – 31.4	2.21 +/- 0.61 1.81 – 2.90	21.9 +/- 3.5 8.1 – 24.9
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements		24.8 +/- 1.9 22.6 – 26.2	10.5 +/- 2.9 8.6 – 13.8	21.9 +/- 3.5 18.1 – 24.9
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	4.97 %	3.24 %	0.10 %
	Fine Particles (1.1 - 4.7 µm)	88.49 %	17.09 %	38.89 %
	Extra-Fine Particles (< 1.1 µm)	6.54 %	79.66 %	61.00 %

1024A



Drug Tested		REF 1024A 22mm OD / OD Installed 6" upstream of the wye in the inspiratory limb of a 22mm circuit		
		Ventolin** HFA	Atrovent** HFA	QVAR** 80
Labeled Metered Dose per Actuation (µg from valve)		120	21	100
Particle Size (MMAD) µm ± SD Range of Measurements		2.30 +/- 0.06 2.23 – 2.35	0.93 +/- 0.09 0.88 – 1.03	1.13 +/- 0.07 1.06 – 1.21
Geometric Standard Deviation µm ± SD Range of Measurements		1.49 +/- 0.01 1.47 – 1.49	1.81 +/- 0.13 1.73 – 1.96	1.64 +/- 0.10 1.57 – 1.76
Total Delivered Dose µg ± SD Range of Measurements		31.7 +/- 7.8 24.3 – 39.9	2.53 +/- 0.18 2.33 – 2.70	22.7 +/- 1.9 20.5 – 23.9
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements		30.7 +/- 7.8 23.5 – 38.9	2.48 +/- 0.15 2.33 – 2.58	22.7 +/- 1.9 20.5 – 23.9
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements		25.6 +/- 6.5 19.6 – 32.4	11.8 +/- 0.7 11.1 – 12.3	22.7 +/- 1.9 20.5 – 23.9
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	5.78 %	3.11 %	0.15 %
	Fine Particles (1.1 - 4.7 µm)	87.85 %	24.17 %	44.62 %
	Extra-Fine Particles (< 1.1 µm)	6.37 %	72.72 %	55.24 %



Drug Tested		REF 1025A 22mm OD / ID Installed at the patient wye in the inspiratory limb of a 22mm circuit		
		Ventolin** HFA	Atrovent** HFA	QVAR** 80
Labeled Metered Dose per Actuation (µg from valve)		120	21	100
Particle Size (MMAD) µm ± SD Range of Measurements		2.31 +/- .08 2.23 – 2.40	0.85 +/- 0.05 0.80 – 0.91	1.05 +/- 0.06 0.99 – 1.11
Geometric Standard Deviation µm ± SD Range of Measurements		1.49 +/- 0.03 1.45 – 1.51	1.78 +/- 0.08 1.69 – 1.85	1.68 +/- 0.14 1.52 – 1.80
Total Delivered Dose µg ± SD Range of Measurements		32.5 +/- 7.4 26.3 – 40.7	2.20 +/- 0.45 1.77 – 2.67	23.9 +/- 4.2 20.4 – 28.5
Total Respirable Dose (< 5.8µm) µg ± SD Range of Measurements		31.4 +/- 6.8 25.6 – 39.0	2.14 +/- 0.40 1.74 – 2.56	23.9 +/- 4.2 20.4 – 28.5
Respirable Fraction (< 5.8 µm) % of valve label mean ± SD Range of Measurements		26.2 +/- 5.7 21.3 – 32.5	10.2 +/- 1.9 8.3 – 12.	23.9 +/- 4.2 20.4 – 28.5
Mass Fraction of Total Delivered Dose	Coarse Particles (> 4.7 µm)	5.64 %	3.55 %	0.03 %
	Fine Particles (1.1 - 4.7 µm)	88.64 %	18.68 %	39.67 %
	Extra-Fine Particles (< 1.1 µm)	5.72 %	77.77 %	60.29 %

1025A

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