

ASHRAE 52.2-2017 Test Results w/Appendix J Results

Filter Description

Manufacturer	Filter Model			Filter Part Number		
Camfil USA	DU4V-ES3-2424-MV13			855081-011		
Filter Type	Media Type			Media Color		
V-Bed	Fiberglass/Wet Laid			White		
Nominal Size	Actual Size					
HxWxD	Hgt (in)	Wid (in)	Dep (in)	Pleats/Pockets	Media Area (ft ²)	UL Rating
24x24x12	23.31	23.31	11.75	4	200.0	Yes

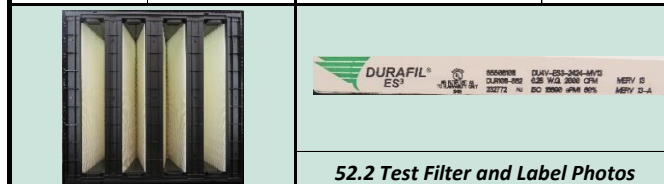
ASHRAE 52.2-2017

Test Report:	231010_5156		
Time:	14:35:45	Date:	Oct 10, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.31	0.28	
MERV	13	13	@2001cfm
E ₁ (0.3-1.0μm), (%)	70	≥ 50	
E ₂ (1.0-3.0μm), (%)	93	≥ 85	
E ₃ (3.0-10μm), (%)	100	≥ 90	
Final DP, (inWG)	1.5	1.5	
Arrestance, (%)	100	98	
DHC, (g)	776		

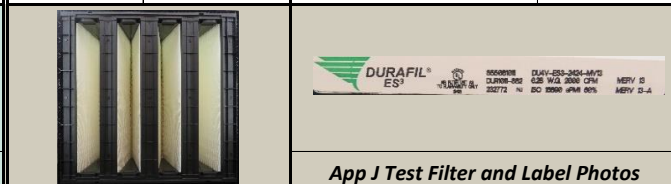
ASHRAE 52.2-2017 w/App J

Test Report:	231011_5155		
Time:	14:23:21	Date:	Oct 11, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.31	0.28	
MERV-A	13A	13A	@2001cfm
E ₁ -A (0.3-1.0μm), (%)	70	≥ 50	
E ₂ -A (1.0-3.0μm), (%)	93	≥ 85	
E ₃ -A (3.0-10μm), (%)	100	≥ 90	
Final DP, (inWG)	1.5	1.5	
Arrestance-A, (%)	100	98	
DHC-A, (g)	764		

Temp, (F)	73	Test Aerosol	KCL
RH, (%)	45	Loading Dust	ASHRAE



Temp, (F)	71	Test Aerosol	KCL
RH, (%)	48	Loading Dust	ASHRAE



Comment	Produced in Riverdale, NJ
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Comment	Produced in Riverdale, NJ
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Certified Test Per ASHRAE 52.2-2017

Approval:	<i>Michael Krause, Laboratories and Materials R&D Manager</i>
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Operator	Particle Counter	Model
Mirna Montoya	TSI	OPS-3330



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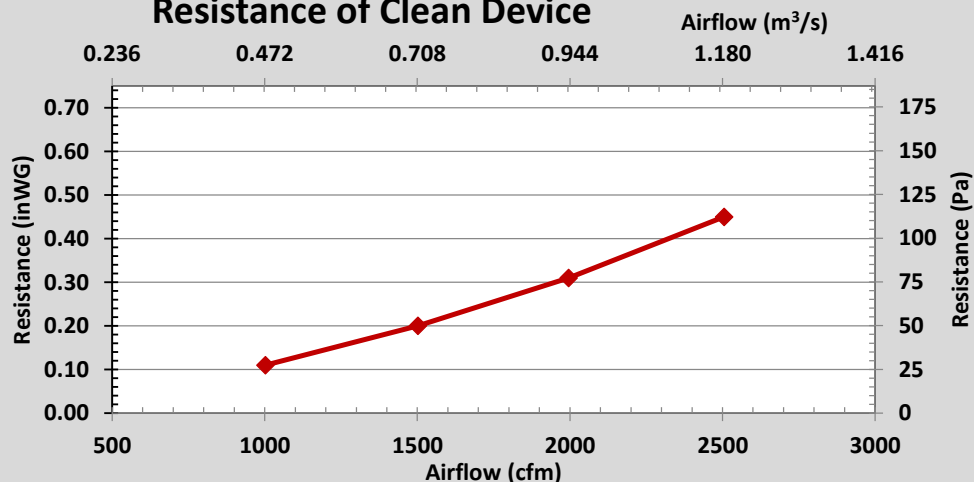
ASHRAE 52.2-2017 Test Results

Date:	Oct 05, 2023	Test Report:	231010_5156
Manufacturer	Filter Model	Filter Part Number	
Camfil USA	DU4V-ES3-2424-MV13	855081-011	

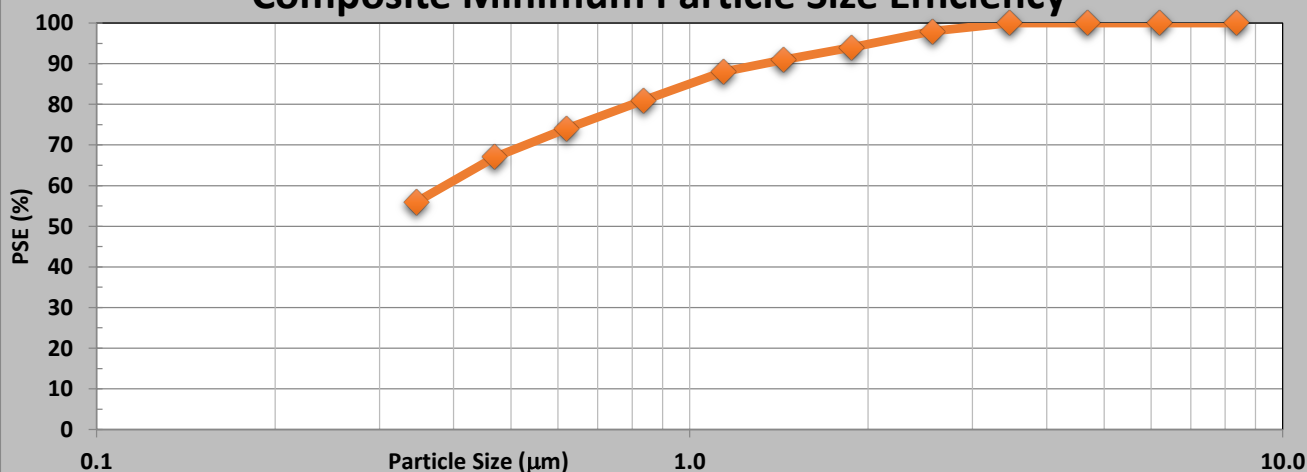
Clean Resistance Table

cfm	inWG
1002	0.11
1502	0.20
1995	0.31
2505	0.45
m ³ /s	Pa
0.473	27
0.709	50
0.942	77
1.182	112

Resistance of Clean Device

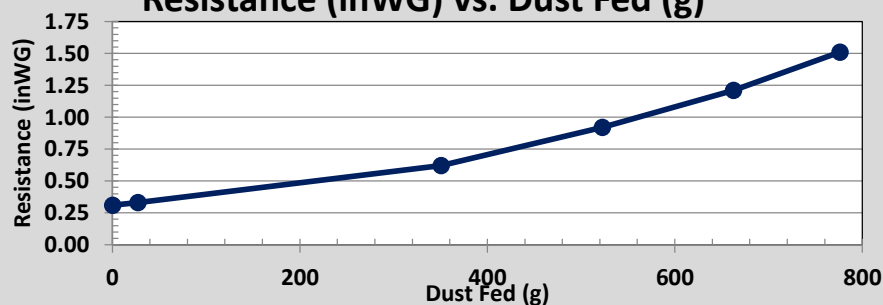


Composite Minimum Particle Size Efficiency



ΔP (inWG)	Dust Fed (g)
0.31	0
0.33	27
0.62	351
0.92	523
1.21	663
1.51	776

Resistance (inWG) vs. Dust Fed (g)



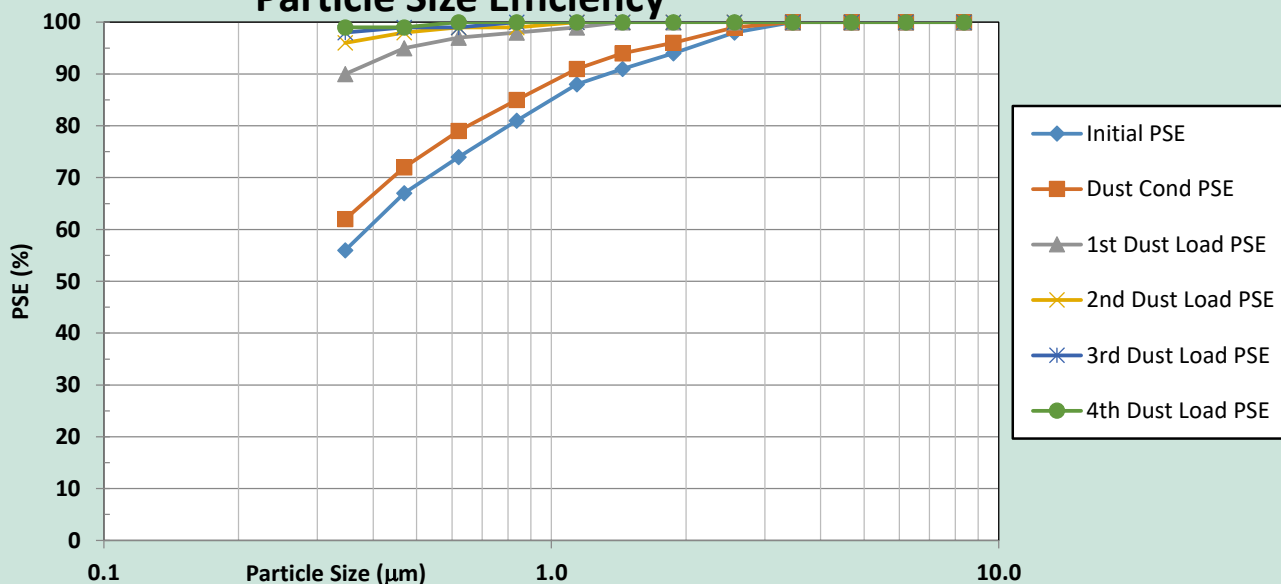


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ASHRAE 52.2-2017 Test Results

Date:	Oct 05, 2023			Test Report:			231010_5156					
Manufacturer				Filter Model					Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV13					855081-011			
Efficiency Data Table												
	1	2	3	4	5	6	7	8	9	10	11	12
Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
Initial PSE	56	67	74	81	88	91	94	98	100	100	100	100
Dust Cond PSE	62	72	79	85	91	94	96	99	100	100	100	100
1st Dust Load PSE	90	95	97	98	99	100	100	100	100	100	100	100
2nd Dust Load PSE	96	98	99	99	100	100	100	100	100	100	100	100
3rd Dust Load PSE	98	99	99	100	100	100	100	100	100	100	100	100
4th Dust Load PSE	99	99	100	100	100	100	100	100	100	100	100	100
Composite Min PSE	56	67	74	81	88	91	94	98	100	100	100	100

Particle Size Efficiency



All testing is performed in compliance with the latest revision of ASHRAE Standard 52.2 in a state-of-the-art laboratory facility located at the Camfil USA headquarters in Riverdale, NJ. For more information, contact your local Camfil representative or distributor.

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For Camfil use only:	5156	13865	13866	13888	5155	13863	13864	13890	13889			
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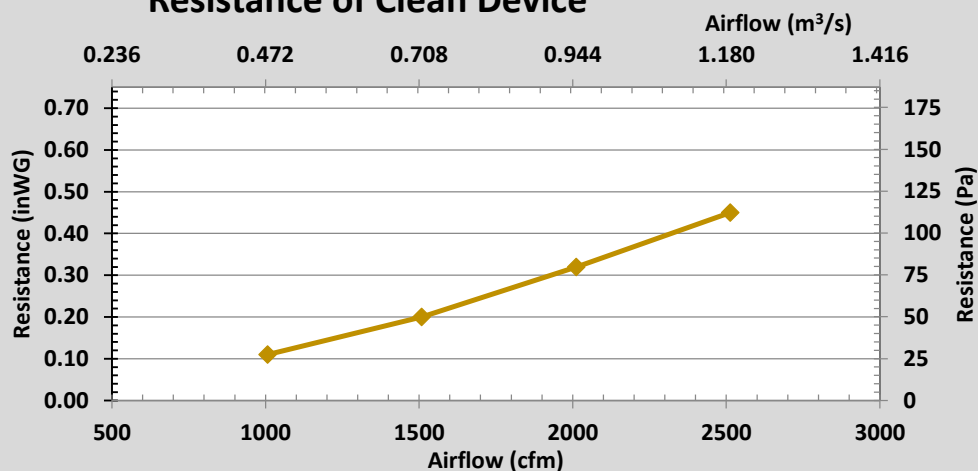
ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/05/2023	Test Number:	231011_5155
Manufacturer	Filter Model		Filter Part Number
Camfil USA	DU4V-ES3-2424-MV13		855081-011

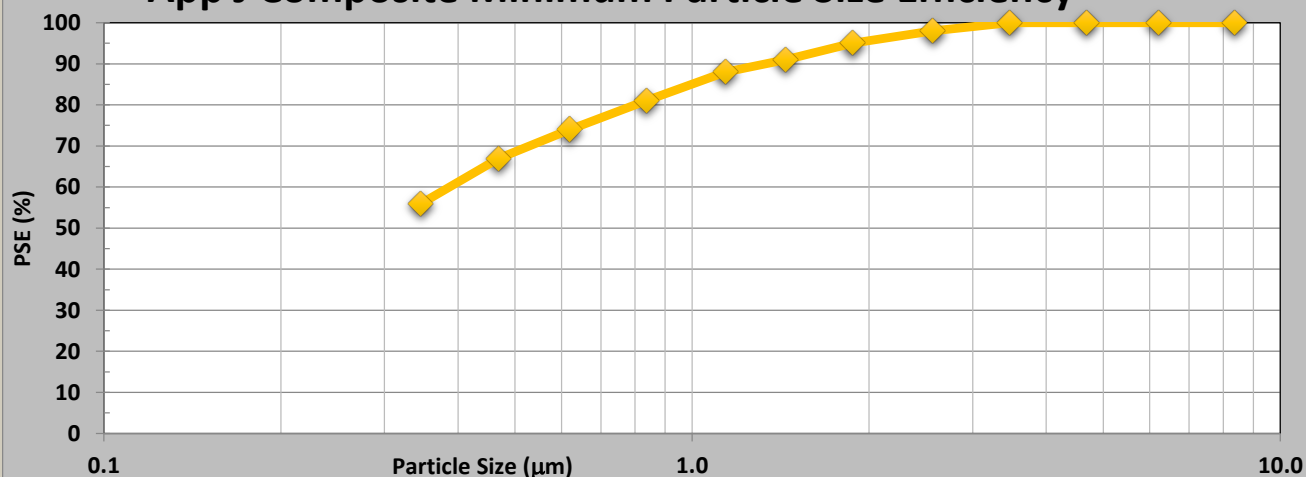
Clean Resistance Table

cfm	inWG
1007	0.11
1509	0.20
2012	0.32
2513	0.45
m ³ /s	Pa
0.475	27
0.712	50
0.950	80
1.186	112

Resistance of Clean Device

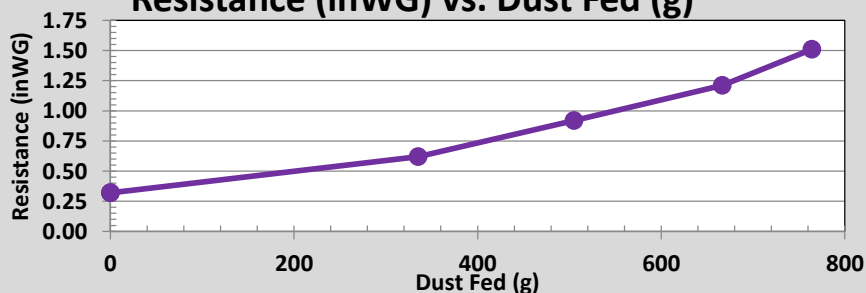


App J Composite Minimum Particle Size Efficiency



ΔP (inWG)	Dust Fed (g)
0.32	0
0.32	0
0.62	335
0.92	505
1.21	667
1.51	764

Resistance (inWG) vs. Dust Fed (g)



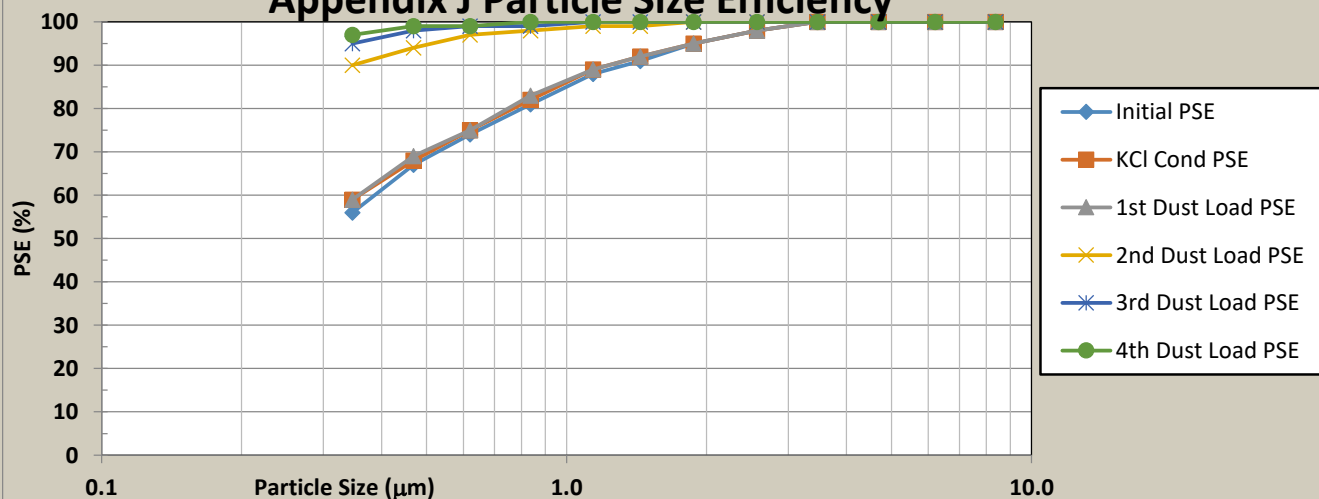


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ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/05/2023			Test Number:			231011_5155						
Manufacturer				Filter Model						Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV13						855081-011			
App J Efficiency Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	56	67	74	81	88	91	95	98	100	100	100	100
	KCl Cond PSE	59	68	75	82	89	92	95	98	100	100	100	100
	1st Dust Load PSE	59	69	75	83	89	92	95	98	100	100	100	100
	2nd Dust Load PSE	90	94	97	98	99	99	100	100	100	100	100	100
	3rd Dust Load PSE	95	98	99	99	100	100	100	100	100	100	100	100
4th Dust Load PSE	97	99	99	100	100	100	100	100	100	100	100	100	
Composite Min PSE	56	67	74	81	88	91	95	98	100	100	100	100	

Appendix J Particle Size Efficiency



Bkg Concentration (particles/cm ³)	Avg Cond Aerosol Conc (particles/cm ³)	Cumulative Cond Duration (minutes)	Cumulative Cond CT (particles-min/cm ³)	
26.0	4.98E+05	282	1.40E+08	
Large Particle Concentration (Particles/cm ³)	Ratio Small to Large (>20,000)	Conditioning ΔP (inWG)		Same duct?
14	35,752	Initial ΔP	Final ΔP	KCl Rig
		0.33	0.33	

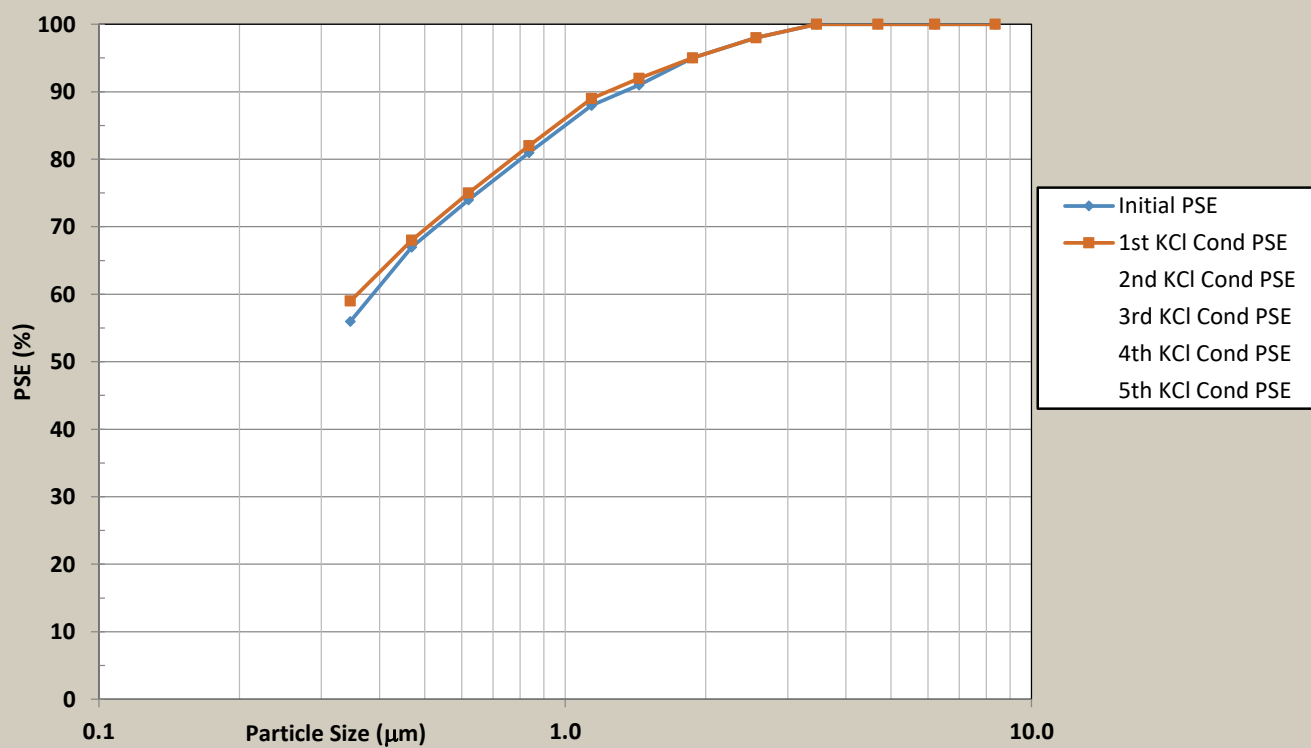


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ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/05/2023			Test Number:			231011_5155						
Manufacturer				Filter Model						Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV13						855081-011			
KCI Conditioning Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	56	67	74	81	88	91	95	98	100	100	100	100
	1st KCI Cond PSE	59	68	75	82	89	92	95	98	100	100	100	100
	2nd KCI Cond PSE												
	3rd KCI Cond PSE												
	4th KCI Cond PSE												
5th KCI Cond PSE													
Final KCI Cond PSE	59	68	75	82	89	92	95	98	100	100	100	100	

KCI Conditioning Particle Size Efficiency

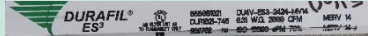


ASHRAE 52.2-2017 Test Results w/Appendix J Results

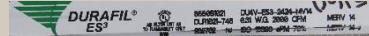
Filter Description

Manufacturer	Filter Model			Filter Part Number		
Camfil Riverdale	DU4V-ES3-2424-MV14			855081-021		
Filter Type	Media Type			Media Color		
V-Bed	Fiberglass/Wet Laid			White		
Nominal Size	Actual Size					
HxWxD	Hgt (in)	Wid (in)	Dep (in)	Pleats/Pockets	Media Area (ft ²)	UL Rating
24x24x12	23.31	23.31	11.75	4	200.0	Yes

ASHRAE 52.2-2017

Test Report:	231016_5160		
Time:	14:18:22	Date:	Oct 16, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.33	0.31	
MERV	14	14	@2001cfm
E ₁ (0.3-1.0μm), (%)	76	≥ 75	
E ₂ (1.0-3.0μm), (%)	95	≥ 90	
E ₃ (3.0-10μm), (%)	100	≥ 95	
Final DP, (inWG)	1.5	1.5	
Arrestance, (%)	100	99	
DHC, (g)	775		
Temp, (F)	72	Test Aerosol	KCL
RH, (%)	45	Loading Dust	ASHRAE
 			
52.2 Test Filter and Label Photos			

ASHRAE 52.2-2017 w/App J

Test Report:	231113_5159		
Time:	14:46:13	Date:	Nov 13, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.33	0.31	
MERV-A	14A	14A	@2001cfm
E ₁ -A (0.3-1.0μm), (%)	76	≥ 75	
E ₂ -A (1.0-3.0μm), (%)	95	≥ 90	
E ₃ -A (3.0-10μm), (%)	100	≥ 95	
Final DP, (inWG)	1.5	1.5	
Arrestance-A, (%)	100	99	
DHC-A, (g)	792		
Temp, (F)	73	Test Aerosol	KCL
RH, (%)	46	Loading Dust	ASHRAE
 			
App J Test Filter and Label Photos			

Comment

Certified Test Per ASHRAE 52.2-2017

Approval: *Michael Krause, Laboratories and Materials R&D Manager*

Comment

Operator

Mirna Montoya

Particle Counter

TSI

Model

OPS-3330



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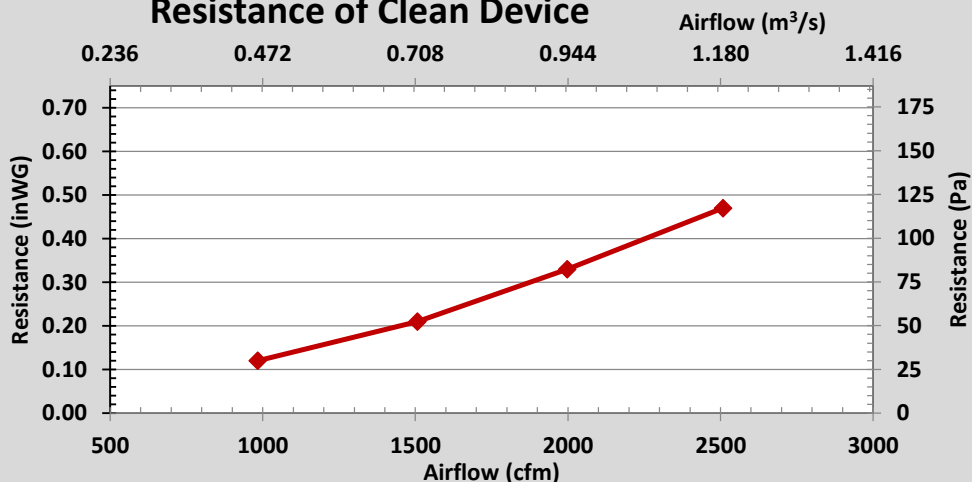
ASHRAE 52.2-2017 Test Results

Date:	Oct 04, 2023	Test Report:	231016_5160
Manufacturer	Filter Model	Filter Part Number	
Camfil Riverdale	DU4V-ES3-2424-MV14	855081-021	

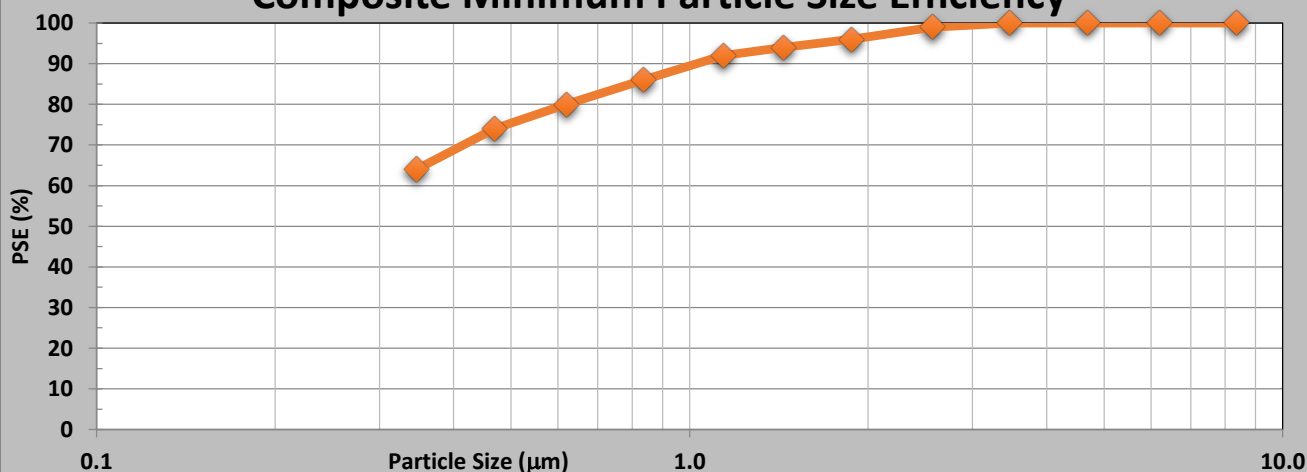
Clean Resistance Table

cfm	inWG
983	0.12
1506	0.21
1997	0.33
2508	0.47
m ³ /s	Pa
0.464	30
0.711	52
0.942	82
1.184	117

Resistance of Clean Device



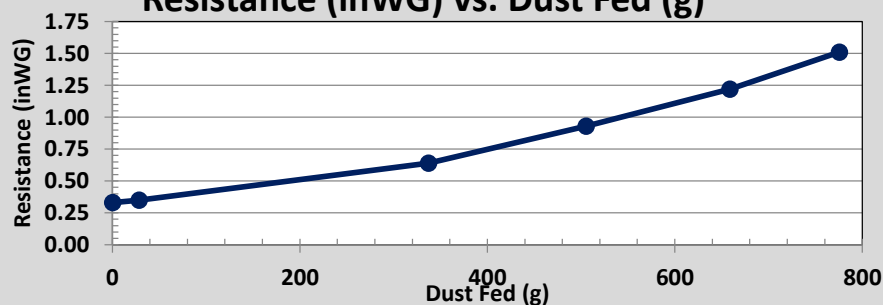
Composite Minimum Particle Size Efficiency



ΔP (inWG) vs Dust Fed (g)

ΔP (inWG)	Dust Fed (g)
0.33	0
0.35	28
0.64	337
0.93	505
1.22	659
1.51	775

Resistance (inWG) vs. Dust Fed (g)

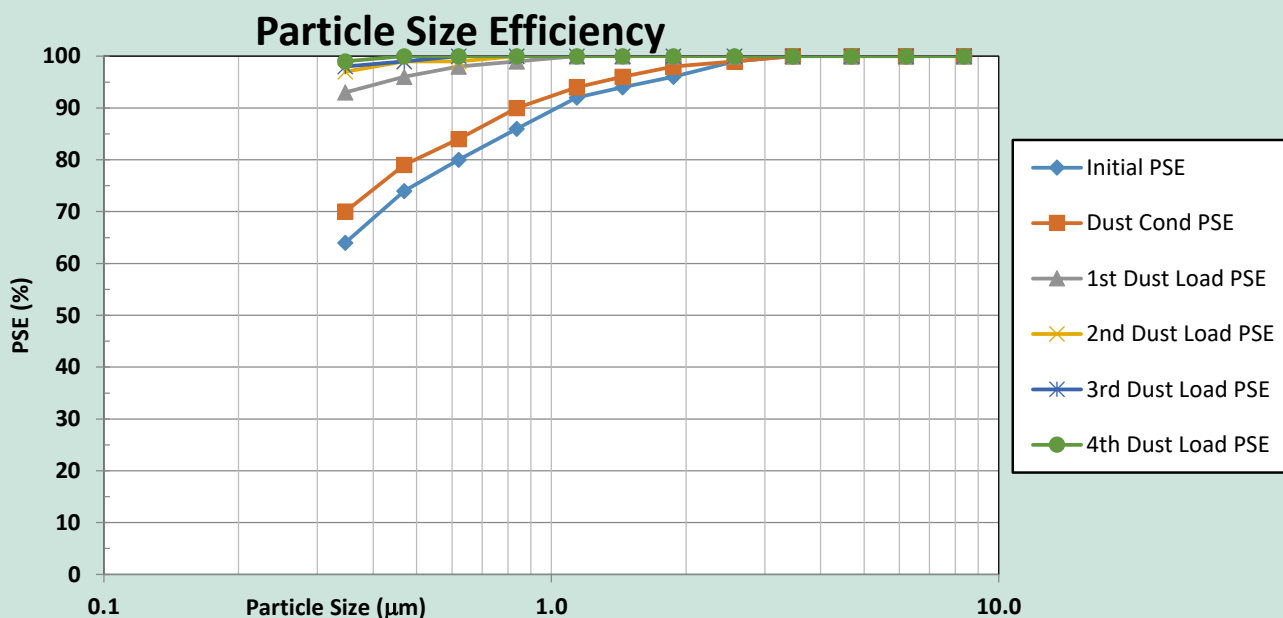




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ASHRAE 52.2-2017 Test Results

Date:	Oct 04, 2023			Test Report:			231016_5160					
Manufacturer				Filter Model					Filter Part Number			
Camfil Riverdale				DU4V-ES3-2424-MV14					855081-021			
Efficiency Data Table												
	1	2	3	4	5	6	7	8	9	10	11	12
Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
Initial PSE	64	74	80	86	92	94	96	99	100	100	100	100
Dust Cond PSE	70	79	84	90	94	96	98	99	100	100	100	100
1st Dust Load PSE	93	96	98	99	100	100	100	100	100	100	100	100
2nd Dust Load PSE	97	99	99	100	100	100	100	100	100	100	100	100
3rd Dust Load PSE	98	99	100	100	100	100	100	100	100	100	100	100
4th Dust Load PSE	99	100	100	100	100	100	100	100	100	100	100	100
Composite Min PSE	64	74	80	86	92	94	96	99	100	100	100	100



All testing is performed in compliance with the latest revision of ASHRAE Standard 52.2 in a state-of-the-art laboratory facility located at the Camfil USA headquarters in Riverdale, NJ. For more information, contact your local Camfil representative or distributor.

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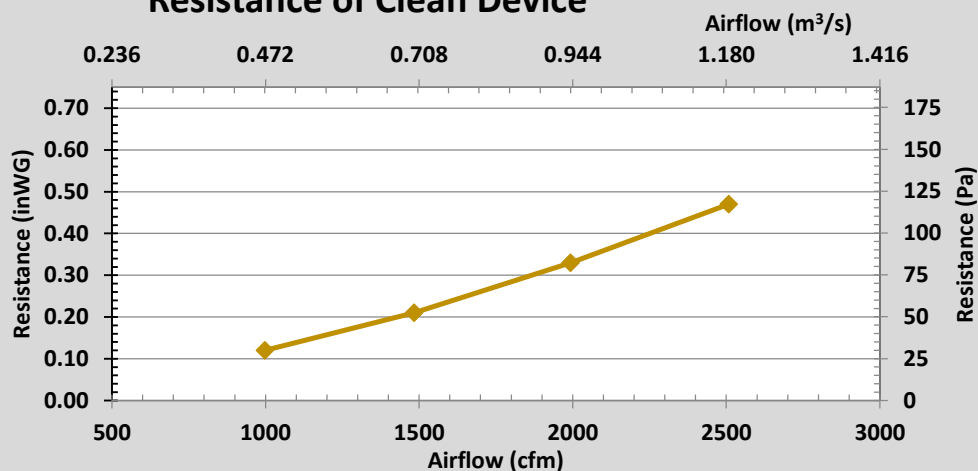
ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/04/2023	Test Number:	231113_5159
Manufacturer	Filter Model		Filter Part Number
Camfil Riverdale	DU4V-ES3-2424-MV14		855081-021

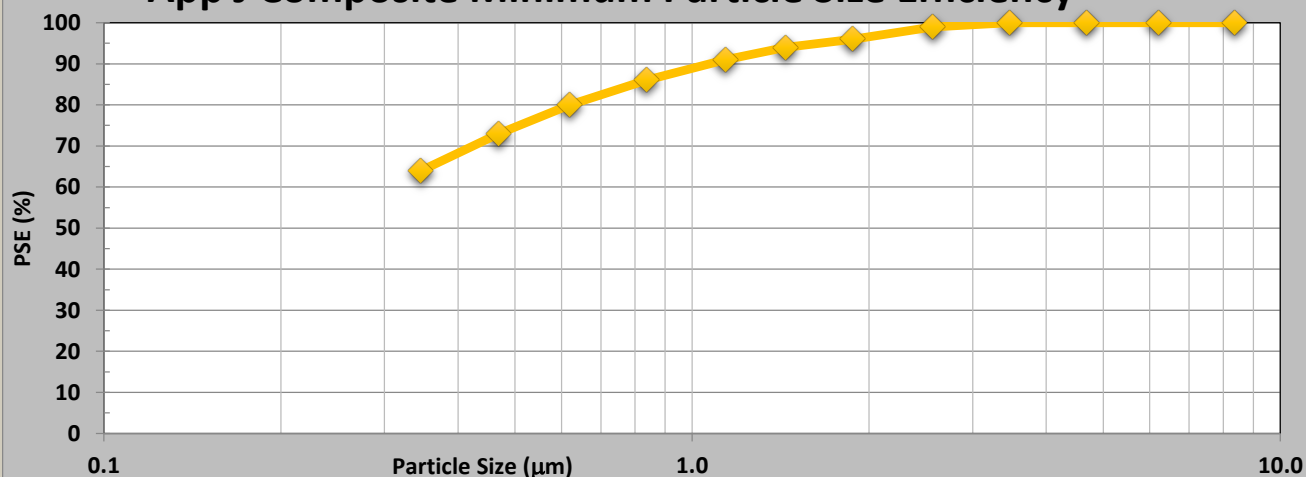
Clean Resistance Table

cfm	inWG
998	0.12
1484	0.21
1993	0.33
2508	0.47
m ³ /s	Pa
0.471	30
0.700	52
0.941	82
1.184	117

Resistance of Clean Device

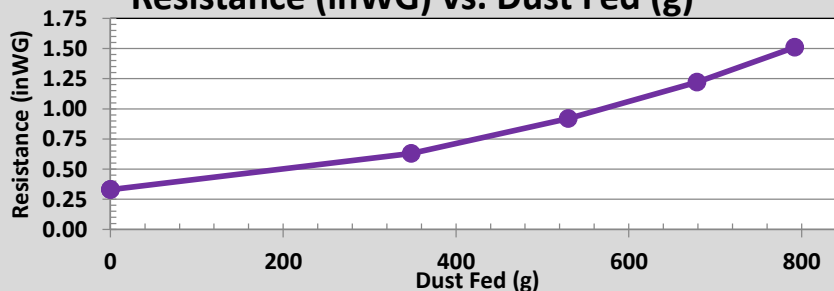


App J Composite Minimum Particle Size Efficiency



ΔP (inWG)	Dust Fed (g)
0.33	0
0.33	0
0.63	348
0.92	530
1.22	679
1.51	792

Resistance (inWG) vs. Dust Fed (g)



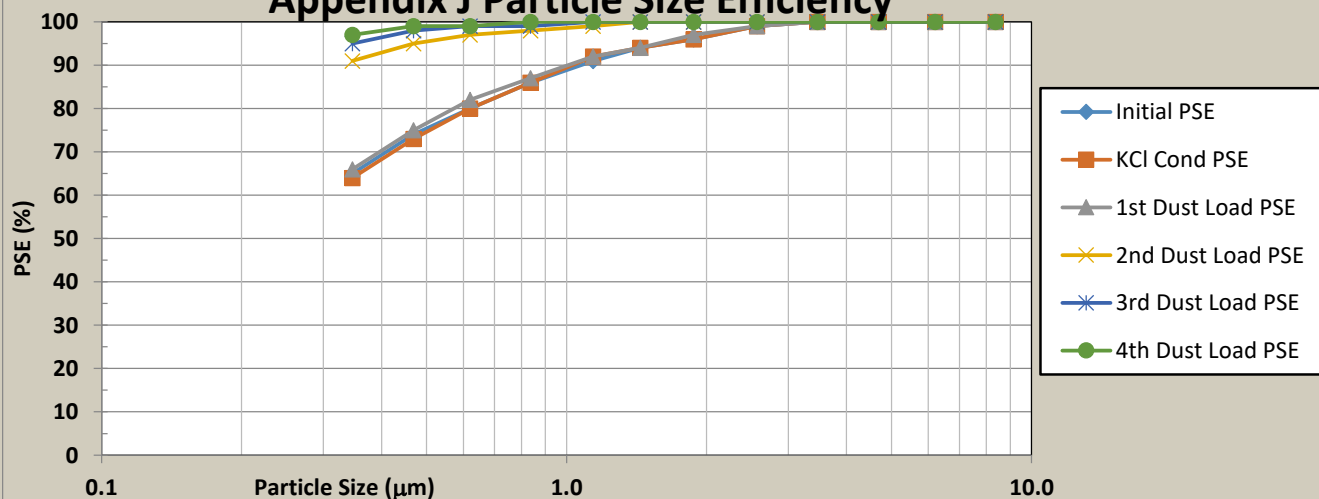


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ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/04/2023			Test Number:			231113_5159						
Manufacturer				Filter Model						Filter Part Number			
Camfil Riverdale				DU4V-ES3-2424-MV14						855081-021			
App J Efficiency Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	65	74	80	86	91	94	96	99	100	100	100	100
	KCl Cond PSE	64	73	80	86	92	94	96	99	100	100	100	100
	1st Dust Load PSE	66	75	82	87	92	94	97	99	100	100	100	100
	2nd Dust Load PSE	91	95	97	98	99	100	100	100	100	100	100	100
	3rd Dust Load PSE	95	98	99	99	100	100	100	100	100	100	100	100
4th Dust Load PSE	97	99	99	100	100	100	100	100	100	100	100	100	
Composite Min PSE	64	73	80	86	91	94	96	99	100	100	100	100	

Appendix J Particle Size Efficiency



Bkg Concentration (particles/cm ³)	Avg Cond Aerosol Conc (particles/cm ³)	Cumulative Cond Duration (minutes)	Cumulative Cond CT (particles-min/cm ³)	
37.0	4.16E+05	162	6.74E+07	
Large Particle Concentration (Particles/cm ³)	Ratio Small to Large (>20,000)	Conditioning ΔP (inWG)		Same duct?
13	31,419	Initial ΔP	Final ΔP	KCl Rig
		0.36	0.36	

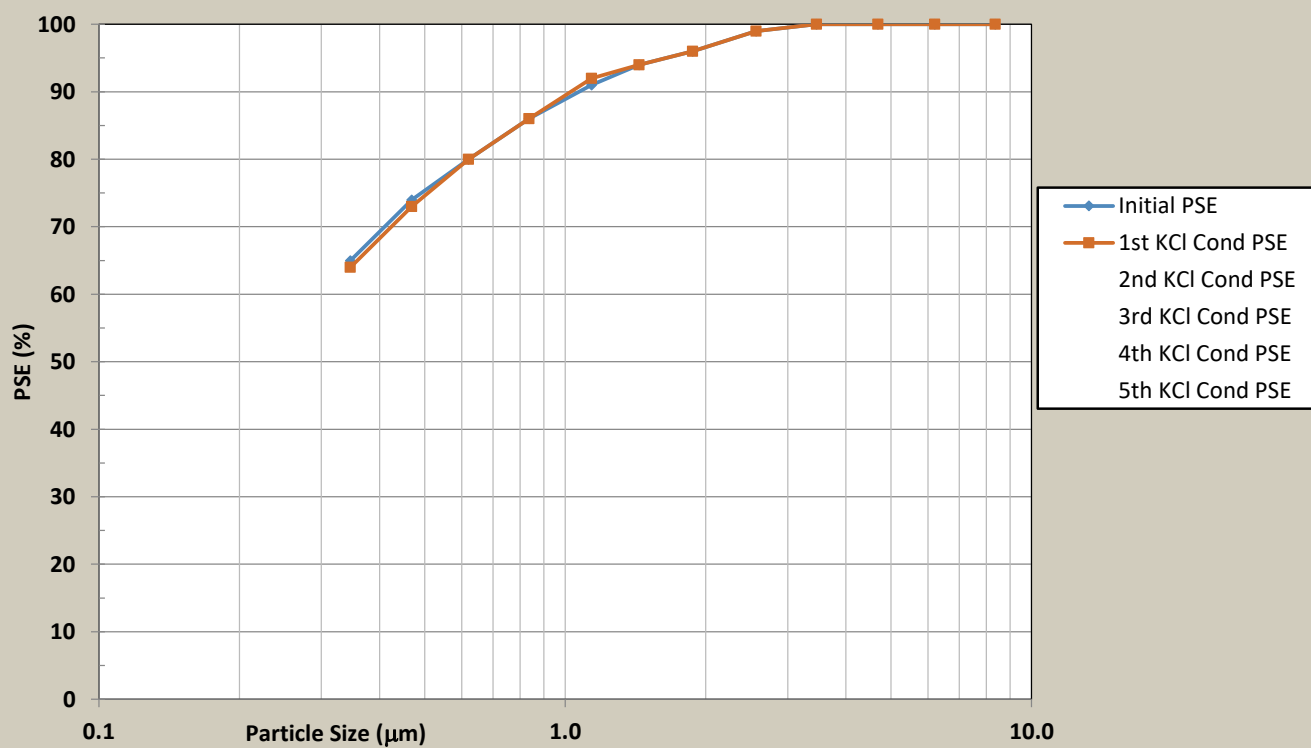


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ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/04/2023			Test Number:			231113_5159						
Manufacturer				Filter Model						Filter Part Number			
Camfil Riverdale				DU4V-ES3-2424-MV14						855081-021			
KCI Conditioning Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	65	74	80	86	91	94	96	99	100	100	100	100
	1st KCI Cond PSE	64	73	80	86	92	94	96	99	100	100	100	100
	2nd KCI Cond PSE												
	3rd KCI Cond PSE												
	4th KCI Cond PSE												
5th KCI Cond PSE													
Final KCI Cond PSE	64	73	80	86	92	94	96	99	100	100	100	100	

KCI Conditioning Particle Size Efficiency



ASHRAE 52.2-2017 Test Results w/Appendix J Results

Filter Description

Manufacturer	Filter Model			Filter Part Number		
Camfil USA	DU4V-ES3-2424-MV16			855081-041		
Filter Type	Media Type			Media Color		
V-Bed	Fiberglass/Wet Laid			White		
Nominal Size	Actual Size					
HxWxD	Hgt (in)	Wid (in)	Dep (in)	Pleats/Pockets	Media Area (ft ²)	UL Rating
24x24x12	23.31	23.31	11.75	4	200.0	Yes

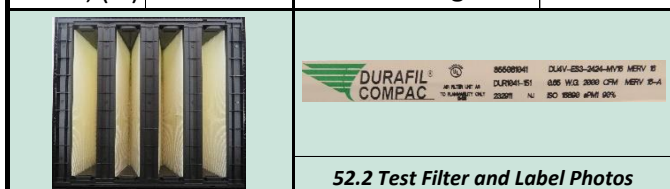
ASHRAE 52.2-2017

Test Report:	231023_5161		
Time:	12:07:23	Date:	Oct 23, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.65	0.65	
MERV	16	16	@2001cfm
E ₁ (0.3-1.0μm), (%)	97	≥ 95	
E ₂ (1.0-3.0μm), (%)	99	≥ 95	
E ₃ (3.0-10μm), (%)	100	≥ 95	
Final DP, (inWG)	1.5	1.5	
Arrestance, (%)	100	100	
DHC, (g)	530		

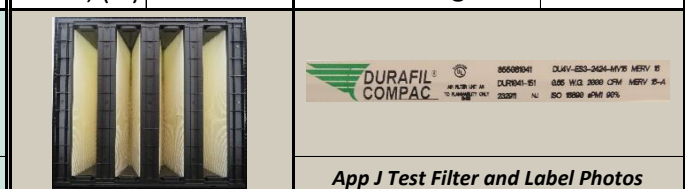
ASHRAE 52.2-2017 w/App J

Test Report:	231027_5162		
Time:	11:17:03	Date:	Oct 27, 2023
Test Data	Test Results	Rated Values	
AirFlow (cfm)	2001	2001	
Nominal Vel (fpm)	500	501	
Initial ΔP (inWG)	0.66	0.65	
MERV-A	16A	16A	@2001cfm
E ₁ -A (0.3-1.0μm), (%)	98	≥ 95	
E ₂ -A (1.0-3.0μm), (%)	100	≥ 95	
E ₃ -A (3.0-10μm), (%)	100	≥ 95	
Final DP, (inWG)	1.5	1.5	
Arrestance-A, (%)	100	100	
DHC-A, (g)	544		

Temp, (F)	71	Test Aerosol	KCL
RH, (%)	47	Loading Dust	ASHRAE



Temp, (F)	71	Test Aerosol	KCL
RH, (%)	48	Loading Dust	ASHRAE



Comment	Produced in Riverdale, NJ
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Comment	Produced in Riverdale, NJ
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Certified Test Per ASHRAE 52.2-2017	
Approval:	<i>Michael Krause, Laboratories and Materials R&D Manager</i>

Operator	Particle Counter	Model
Mirna Montoya	TSI	OPS-3330

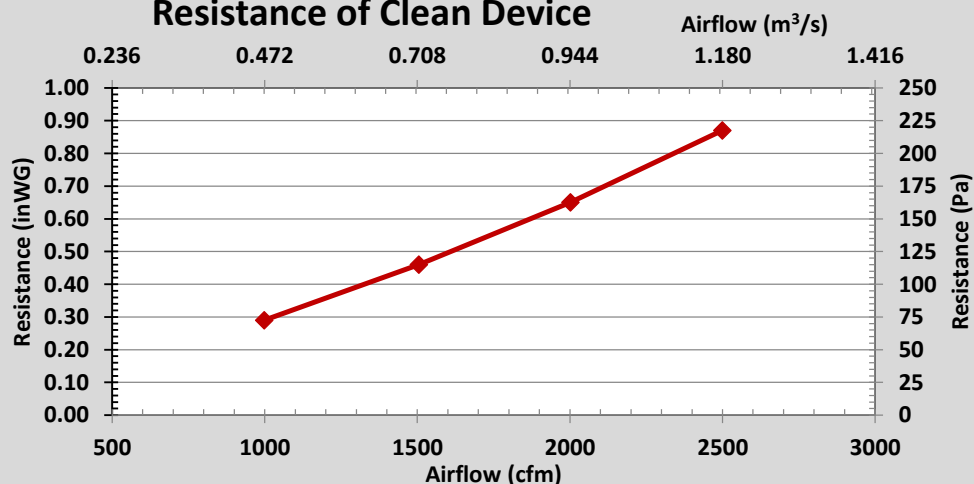
ASHRAE 52.2-2017 Test Results

Date:	Oct 19, 2023	Test Report:	231023_5161
Manufacturer	Filter Model	Filter Part Number	
Camfil USA	DU4V-ES3-2424-MV16	855081-041	

Clean Resistance Table

cfm	inWG
998	0.29
1504	0.46
2001	0.65
2499	0.87
m ³ /s	Pa
0.471	72
0.710	115
0.944	162
1.179	217

Resistance of Clean Device

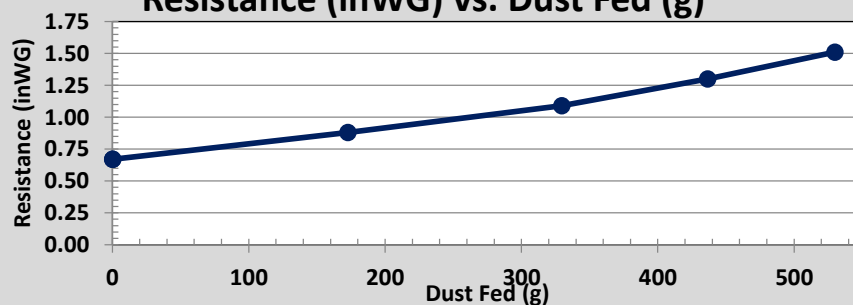


Composite Minimum Particle Size Efficiency



ΔP (inWG)	Dust Fed (g)
0.67	0
0.67	0
0.88	173
1.09	329
1.30	437
1.51	530

Resistance (inWG) vs. Dust Fed (g)



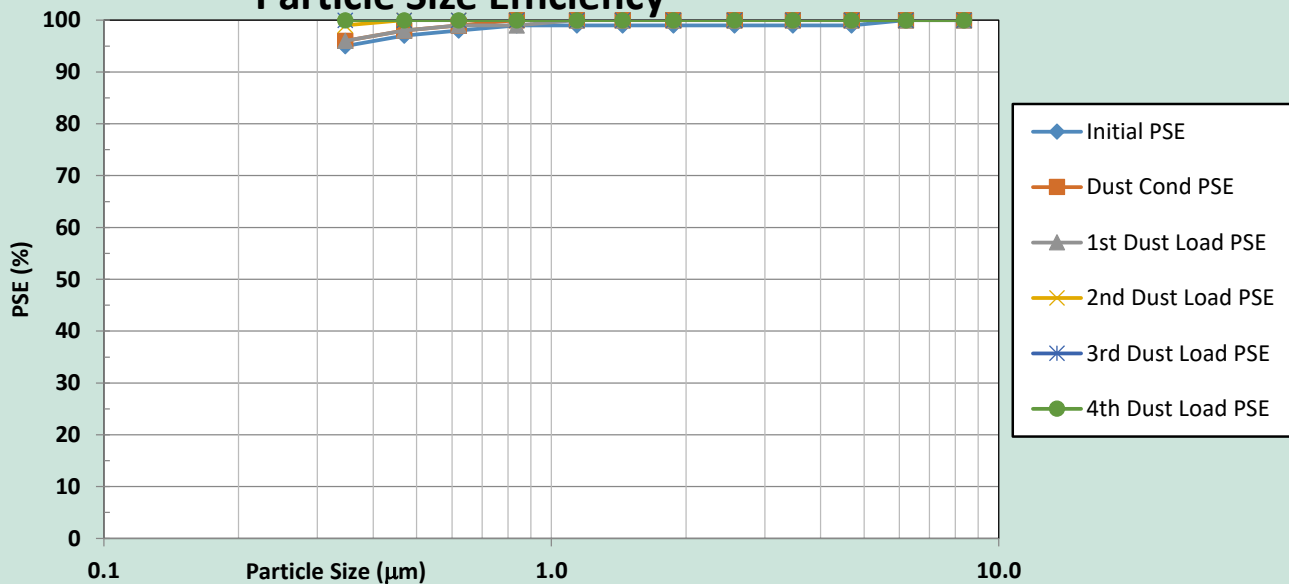


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ASHRAE 52.2-2017 Test Results

Date:	Oct 19, 2023			Test Report:			231023_5161					
Manufacturer				Filter Model					Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV16					855081-041			
Efficiency Data Table												
	1	2	3	4	5	6	7	8	9	10	11	12
Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
Initial PSE	95	97	98	99	99	99	99	99	99	99	100	100
Dust Cond PSE	96	98	99	100	100	100	100	100	100	100	100	100
1st Dust Load PSE	96	98	99	99	100	100	100	100	100	100	100	100
2nd Dust Load PSE	99	100	100	100	100	100	100	100	100	100	100	100
3rd Dust Load PSE	100	100	100	100	100	100	100	100	100	100	100	100
4th Dust Load PSE	100	100	100	100	100	100	100	100	100	100	100	100
Composite Min PSE	95	97	98	99	99	99	99	99	99	99	100	100

Particle Size Efficiency



All testing is performed in compliance with the latest revision of ASHRAE Standard 52.2 in a state-of-the-art laboratory facility located at the Camfil USA headquarters in Riverdale, NJ. For more information, contact your local Camfil representative or distributor.

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For Camfil use only:	5161	13954	13955	13968	5162	13952	13953	14028	13958			
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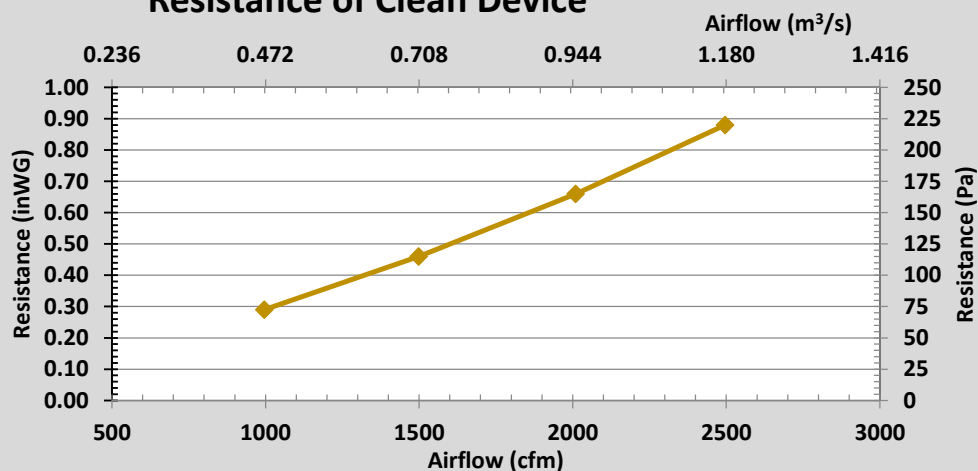
ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/19/2023	Test Number:	231027_5162
Manufacturer	Filter Model	Filter Part Number	
Camfil USA	DU4V-ES3-2424-MV16	855081-041	

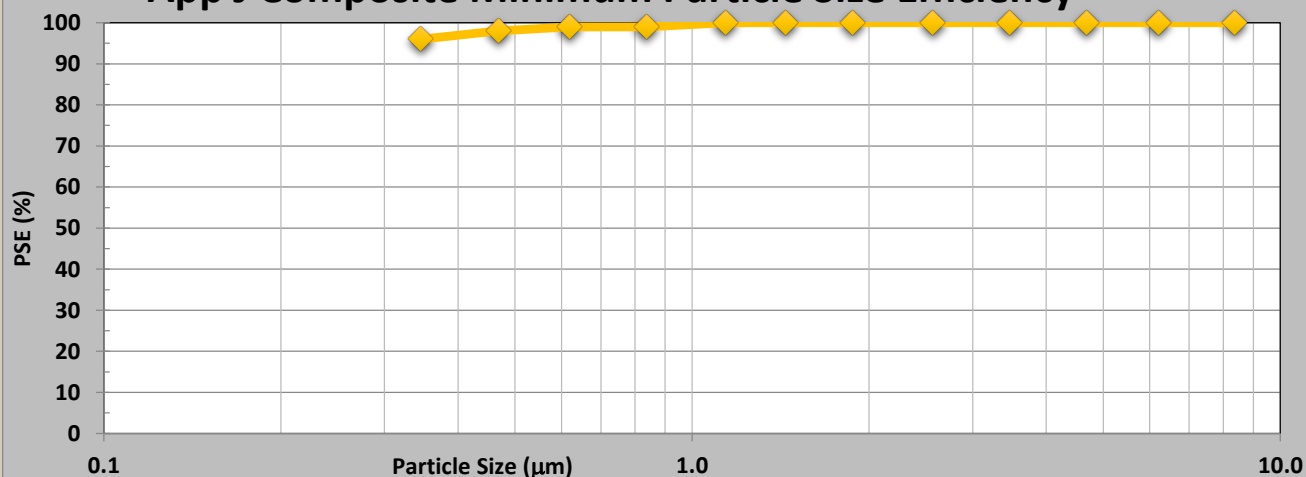
Clean Resistance Table

cfm	inWG
996	0.29
1499	0.46
2010	0.66
2497	0.88
m ³ /s	Pa
0.470	72
0.707	115
0.949	164
1.178	219

Resistance of Clean Device

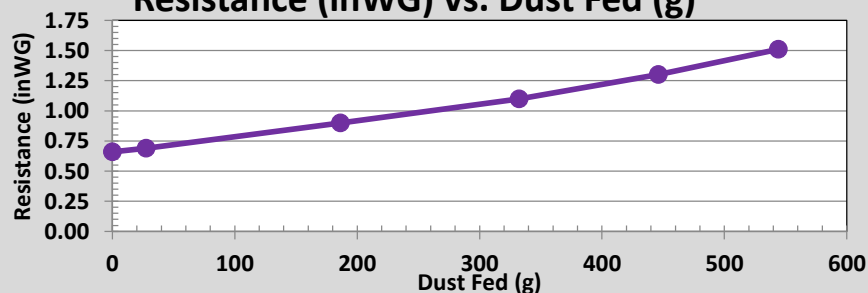


App J Composite Minimum Particle Size Efficiency



ΔP (inWG)	Dust Fed (g)
0.66	0
0.69	28
0.90	186
1.10	332
1.30	446
1.51	544

Resistance (inWG) vs. Dust Fed (g)



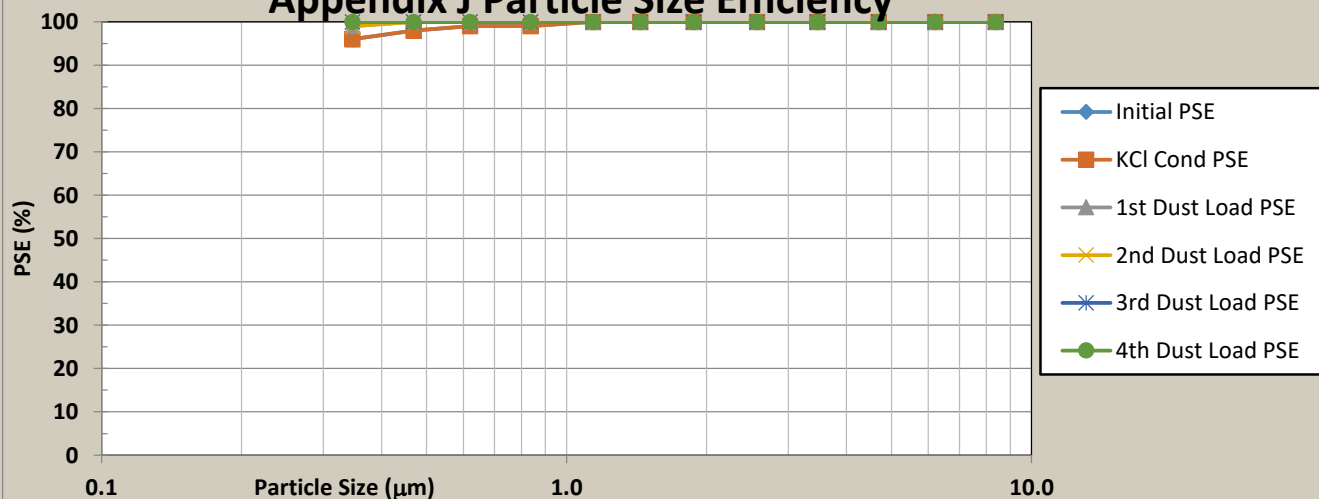


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ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/19/2023			Test Number:			231027_5162						
Manufacturer				Filter Model						Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV16						855081-041			
App J Efficiency Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	96	98	99	99	100	100	100	100	100	100	100	100
	KCl Cond PSE	96	98	99	99	100	100	100	100	100	100	100	100
	1st Dust Load PSE	99	100	100	100	100	100	100	100	100	100	100	100
	2nd Dust Load PSE	99	100	100	100	100	100	100	100	100	100	100	100
	3rd Dust Load PSE	100	100	100	100	100	100	100	100	100	100	100	100
	4th Dust Load PSE	100	100	100	100	100	100	100	100	100	100	100	100
	Composite Min PSE	96	98	99	99	100	100	100	100	100	100	100	100

Appendix J Particle Size Efficiency



Bkg Concentration (particles/cm ³)	Avg Cond Aerosol Conc (particles/cm ³)	Cumulative Cond Duration (minutes)	Cumulative Cond CT (particles-min/cm ³)	
33.0	3.35E+05	215	7.21E+07	
Large Particle Concentration (Particles/cm ³)	Ratio Small to Large (>20,000)	Conditioning ΔP (inWG)		Same duct?
14	24,301	Initial ΔP	Final ΔP	KCl Rig
		0.65	0.66	

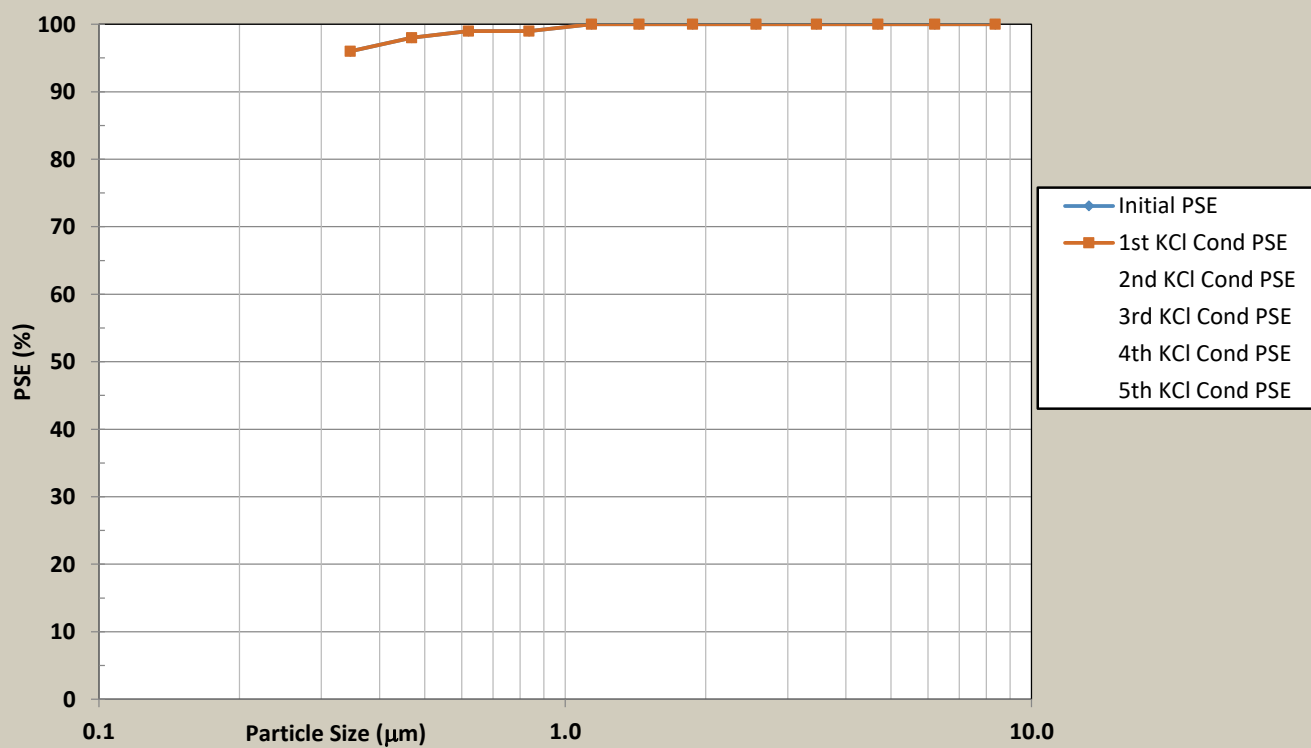


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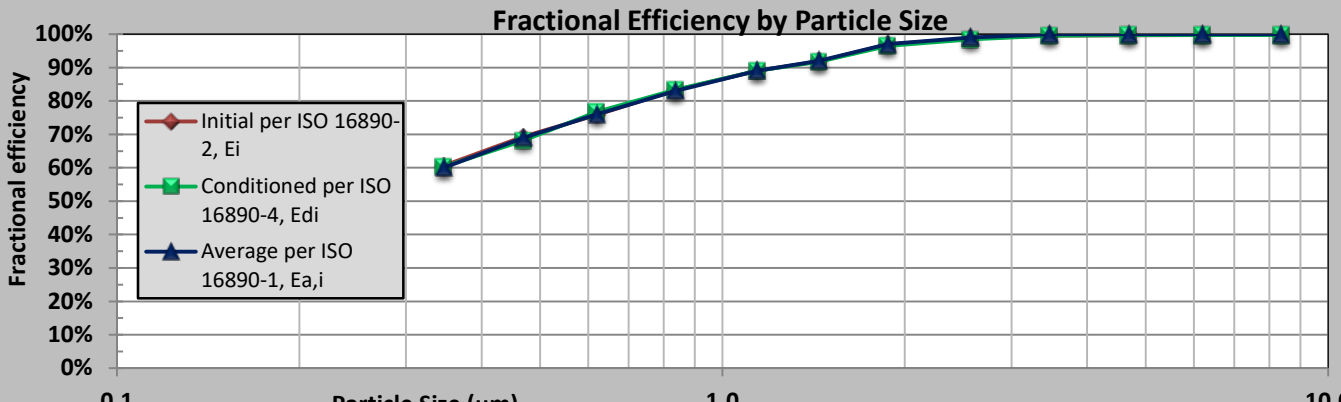
ASHRAE 52.2-2017 Test Results w/Appendix J Results

Date:	10/19/2023			Test Number:			231027_5162						
Manufacturer				Filter Model						Filter Part Number			
Camfil USA				DU4V-ES3-2424-MV16						855081-041			
KCI Conditioning Data Table													
	1	2	3	4	5	6	7	8	9	10	11	12	
	Minimum Dia (µm)	0.3	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0
	Maximum Dia (µm)	0.4	0.55	0.7	1.0	1.3	1.6	2.2	3.0	4.0	5.5	7.0	10.0
	Geometric Mean (µm)	0.35	0.47	0.62	0.84	1.14	1.44	1.88	2.57	3.46	4.69	6.20	8.37
	Initial PSE	96	98	99	99	100	100	100	100	100	100	100	100
	1st KCI Cond PSE	96	98	99	99	100	100	100	100	100	100	100	100
	2nd KCI Cond PSE												
	3rd KCI Cond PSE												
	4th KCI Cond PSE												
5th KCI Cond PSE													
Final KCI Cond PSE	96	98	99	99	100	100	100	100	100	100	100	100	

KCI Conditioning Particle Size Efficiency



ISO 16890-1:2016 - Air Filter Test Results Summary

Test Information									
Report ID			Report Date		Test Requested by			Supervisor	
USA-1601-4340R			2-Dec-2019		Manufacturer			Don Thornburg	
Device Tested									
Manufacturer		Model		Part Number		How Test Sample Obtained & Date			
Camfil USA		Durafil 4V ES M14		855080-009		Manufacturer Supplied		14-Aug-2017	
Nom Size HxWxD (in)		Pleats/Pockets		Media Color		Media Charge		Media Adhesive	
24x24x12		4		White		None		None	
Media Type			Media Area (ft ²)		Product Type		UL Rating		
Fiberglass/Wet Laid			200		V-bed		UL 900		
Test Results Summary									
Resistance to Airflow					Fractional Efficiency and ISO Rating				
Airflow (cfm)	Measured Resistance (inWG)	Met Published value	Rated Initial Resistance (inWG)	Product Literature listed ISO 16890 Rating	ISO 16890 Rating				
2000	0.30		0.30	ISO 0%	ISO ePM1 70%				
Arrestance:	Initial:	#####	Average:		ePM ₁	ePM _{1,min}	ePM _{2,5}	ePM _{2,5,min}	ePM ₁₀
Rated Final Resistance (inWG)			0		70%	70%	78%	78%	93%
Test Dust Capacity (TDC) (g)									
Test Information and Included Reports									
Test Type		Test ID		Test Date		Test Time		Test Operator	
Initial per ISO 16890-2		USA-1601-4340		2-Dec-2019		12:00		A. Acain	
Conditioned per ISO 16890-4		USA-1606-4358		5-Dec-2019		11:31		A. Acain	
Dust Loaded per 16890-3		USA--		0-Jan-1900		0:00		0	
Fractional Efficiency by Particle Size 									
Approvals									
		Certified Test Per ISO ISO 16890-1:2016				Test Organization		Camfil USA 1 N. Corporate Dr. Riverdale, NJ 07457 (973) 616-7300	
		Don Thornburg, R&D Manager							
		Electronic Signature, Original on file							
Note:		The results of this test relate only to the test device in the condition stated herein. The performance results cannot by themselves be quantitatively applied to predict filtration performance in all "real life" environments.							

ISO 16890-1:2016 - Air Filter Test Results Details

Test Information

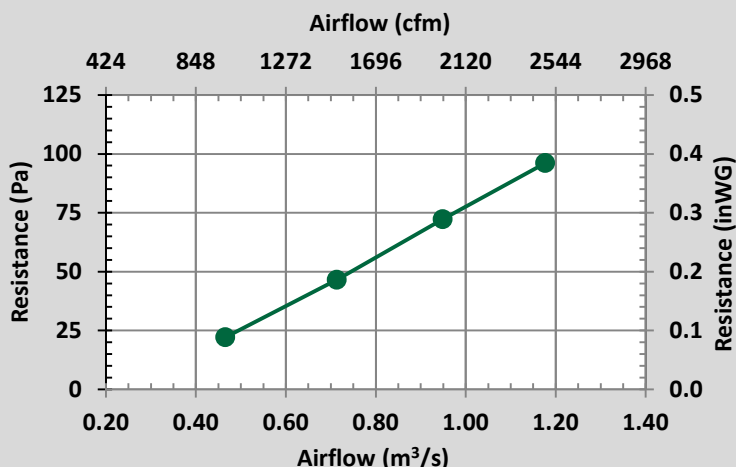
Report ID	Report Date	Test Organization	Supervisor
USA-1601-4340R	2-Dec-2019	Camfil USA	Don Thornburg

Clean Resistance Table at 1.2kg/m³

Test Airflow			Resistance	
% Rated	m ³ /s	cfm	Pa	inWG
50%	0.47	1000	22	0.11
75%	0.71	1500	47	0.22
100%	0.95	2000	72	0.32
125%	1.18	2500	96	0.42

For complete Test Result Details and data, please review the individual test reports for ISO 16890-2, 16890-3, and 16890-4.

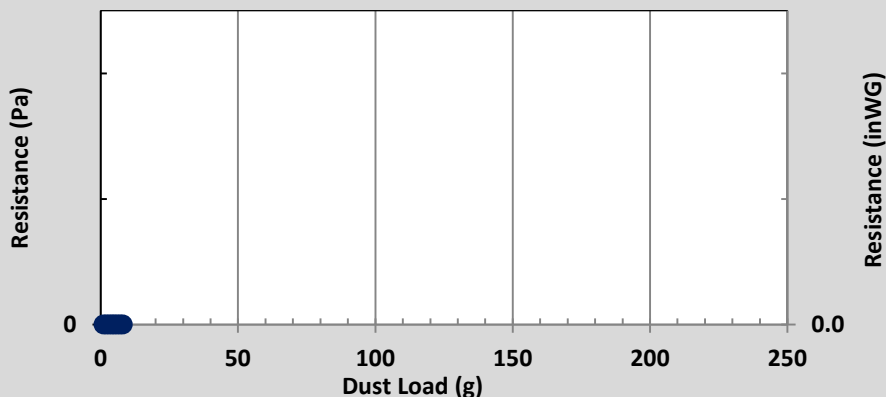
Resistance of Clean Device



Dust Captured Table

Resistance to Airflow		Dust Load (g)
Pa	inWG	
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

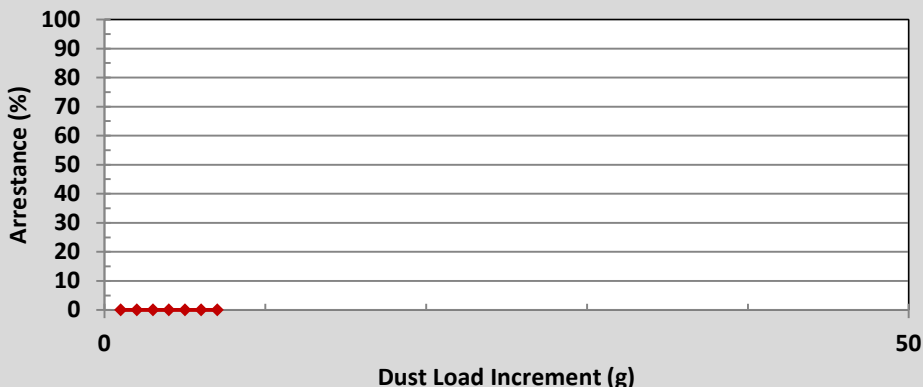
Resistance vs. Test Dust Captured



Arrestance Table

Arrestance (%)	Dust Load Increment (g)
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A

Arrestance vs. Test Dust Captured



Note:

The results of this test relate only to the test device in the condition stated herein. The performance results cannot by themselves be quantitatively applied to predict filtration performance in all "real life" environments.

ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-1601-4340R	2-Dec-2019	Camfil USA	Don Thornburg

Fractional Efficiency Values							
i	d_i	d_{i+1}	d_m	$\Delta \ln d_i$	E_i	$E_{D,i}$	$E_{A,i}$
1	0.30	0.40	0.35	0.29	61%	60%	60%
2	0.40	0.55	0.47	0.32	69%	68%	69%
3	0.55	0.70	0.62	0.24	76%	77%	76%
4	0.70	1.00	0.84	0.36	83%	83%	83%
5	1.00	1.30	1.14	0.26	89%	89%	89%
6	1.30	1.60	1.44	0.21	92%	92%	92%
7	1.60	2.20	1.88	0.32	97%	96%	97%
8	2.20	3.00	2.57	0.31	99%	98%	99%
9	3.00	4.00	3.46	0.29	100%	100%	100%
10	4.00	5.50	4.69	0.32	100%	100%	100%
11	5.50	7.00	6.20	0.24	100%	100%	100%
12	7.00	10.00	8.37	0.36	100%	100%	100%

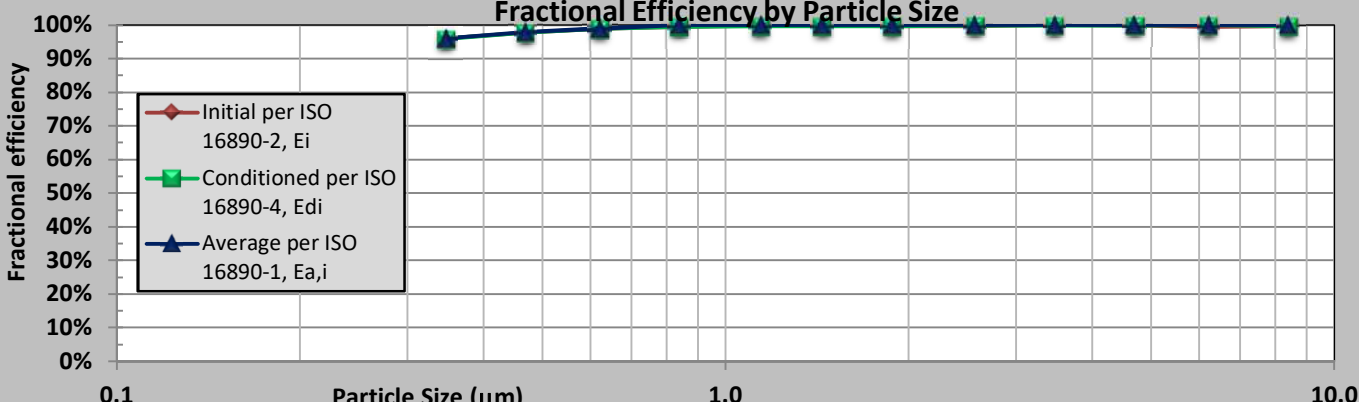
Symbols and Units	
d_i	Lower limit particle diameter in a size range i , μm
d_{i+1}	Upper limit particle diameter in a size range i , μm
d_m	Geometric mean diameter of a size range, μm
$\Delta \ln d_i$	Logarithmic width of a particle diameter size range i
E_i	Initial fractional efficiency of particle size range i of the untreated and unloaded filter element, %
$E_{D,i}$	Fractional efficiency of particle size range i of the conditioned filter element, %
$E_{A,i}$	Average fractional efficiency of particle size range i , %

ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-1601-4340R	2-Dec-2019	Camfil USA	Don Thornburg

Calculation of PM Efficiencies								
i	d_m	$\Delta \ln d_i$	q_{3u} (Urban Distribution)	$q_{3u} * \Delta \ln d_i$	$E_{D,i} * q_{3u} *$ $\Delta \ln d_i$	$E_{A,i} * q_{3u} *$ $\Delta \ln d_i$	ePM _{1,min}	ePM ₁
	μm	μm						
1	0.35	0.29	22.627%	0.065095	0.039260	0.039057		
2	0.47	0.32	19.891%	0.063343	0.043141	0.043707		
3	0.62	0.24	15.837%	0.038193	0.029336	0.029027		
4	0.84	0.36	11.522%	0.041097	0.034273	0.034111	70%	70%
Sums:				0.207728	0.146010	0.145901		
5	1.14	0.26	8.503%	0.022309	0.019870	0.019855	ePM _{2.5, min}	ePM _{2.5}
6	1.44	0.21	7.618%	0.015817	0.014517	0.014552		
7	1.88	0.32	8.022%	0.025546	0.024642	0.024779		
8	2.57	0.31	9.984%	0.030966	0.030481	0.030656		
Sums:				0.302366	0.235521	0.235744	78%	78%
i	d_m	$\Delta \ln d_i$	q_{3r} (Rural Distribution)	$q_{3r} * \Delta \ln d_i$		$E_{A,i} * q_{3r} *$ $\Delta \ln d_i$		
	μm	μm						
1	0.35	0.29	9.412%	0.027077		0.016246		
2	0.47	0.32	8.395%	0.026733		0.018446		
3	0.62	0.24	7.432%	0.017924		0.013622		
4	0.84	0.36	7.014%	0.025016		0.020763		
5	1.14	0.26	7.628%	0.020013		0.017812		
6	1.44	0.21	8.833%	0.018340		0.016873		
7	1.88	0.32	10.804%	0.034406		0.033374		
8	2.57	0.31	13.726%	0.042573		0.042147		
9	3.46	0.29	16.708%	0.048067		0.048067		
10	4.69	0.32	19.542%	0.062233		0.062233	ePM ₁₀	
11	6.20	0.24	21.671%	0.052261		0.052261	93%	
12	8.37	0.36	23.143%	0.082545		0.082545		
Sums:				0.457189		0.424390		

ISO 16890-1:2016 - Air Filter Test Results Summary

Test Information									
Report ID			Report Date		Test Requested by			Supervisor	
USA-2100-5893R			20-Oct-2020		Manufacturer			Don Thornburg	
Device Tested									
Manufacturer		Model		Part Number		How Test Sample Obtained & Date			
Camfil USA		Durafil 4V ES M16		855080-014		Manufacturer Supplied		14-Aug-2017	
Nom Size HxWxD (in)		Pleats/Pockets		Media Color		Media Charge		Media Adhesive	
24x24x12		4		White		None		None	
Media Type			Media Area (ft ²)		Product Type		UL Rating		
Fiberglass/Wet Laid			200		Durafil ES		UL 900		
Test Results Summary									
Resistance to Airflow					Fractional Efficiency and ISO Rating				
Airflow (cfm)	Measured Resistance (inWG)	Met Published value	Rated Initial Resistance (inWG)		Product Literature listed ISO 16890 Rating		ISO 16890 Rating		
2001	0.66		0.64		ISO ePM1 90%%		ISO ePM1 95%		
Arrestance:	Initial:	#####	Average:		ePM ₁	ePM _{1,min}	ePM _{2,5}	ePM _{2,5,min}	ePM ₁₀
Rated Final Resistance (inWG)			0		98%	98%	99%	98%	100%
Test Dust Capacity (TDC) (g)									
Test Information and Included Reports									
Test Type		Test ID		Test Date		Test Time		Test Operator	
Initial per ISO 16890-2		USA-2100-5893		16-Oct-2020		2:36		A. Acain	
Conditioned per ISO 16890-4		USA-2100-5897		19-Oct-2020		3:35		A. Acain	
Dust Loaded per 16890-3		USA--		0-Jan-1900		0:00		0	
Fractional Efficiency by Particle Size 									
Approvals									
		Certified Test Per ISO ISO 16890-1:2016				Test Organization		Camfil USA 1 N. Corporate Dr. Riverdale, NJ 07457 (973) 616-7300	
		Don Thornburg, R&D Manager							
		Electronic Signature, Original on file							
Note:		The results of this test relate only to the test device in the condition stated herein. The performance results cannot by themselves be quantitatively applied to predict filtration performance in all "real life" environments.							

ISO 16890-1:2016 - Air Filter Test Results Details

Test Information

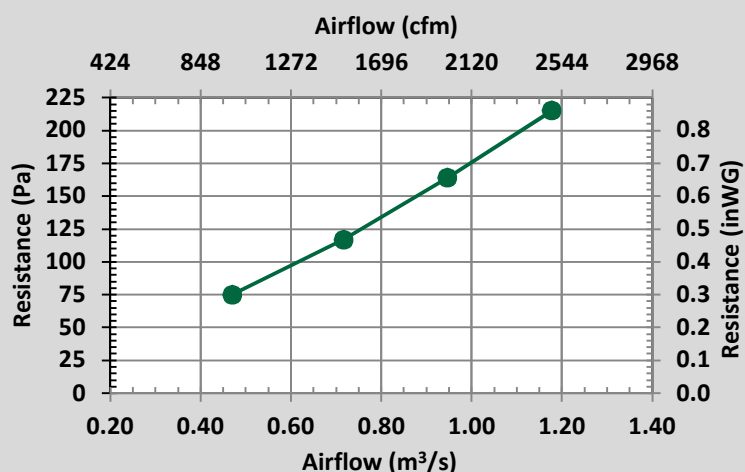
Report ID	Report Date	Test Organization	Supervisor
USA-2100-5893R	20-Oct-2020	Camfil USA	Don Thornburg

Clean Resistance Table at 1.2kg/m³

Test Airflow			Resistance	
% Rated	m ³ /s	cfm	Pa	inWG
50%	0.47	1000	75	0.31
75%	0.72	1500	117	0.51
100%	0.95	2000	164	0.71
125%	1.18	2500	215	0.86

For complete Test Result Details and data, please review the individual test reports for ISO 16890-2, 16890-3, and 16890-4.

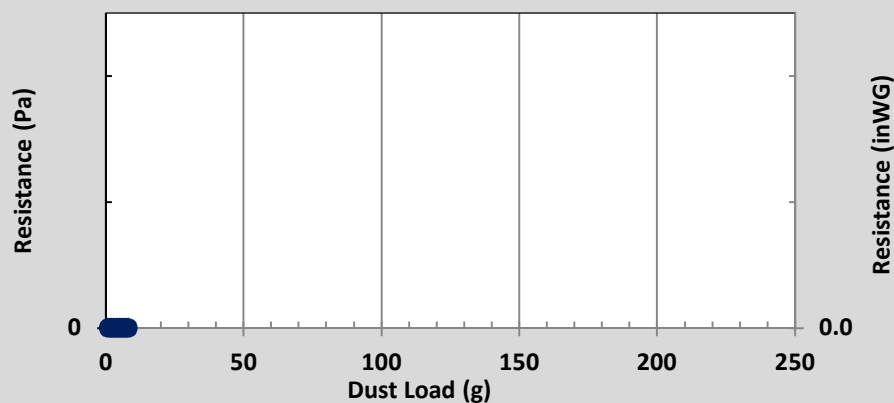
Resistance of Clean Device



Dust Captured Table

Resistance to Airflow		Dust Load (g)
Pa	inWG	
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

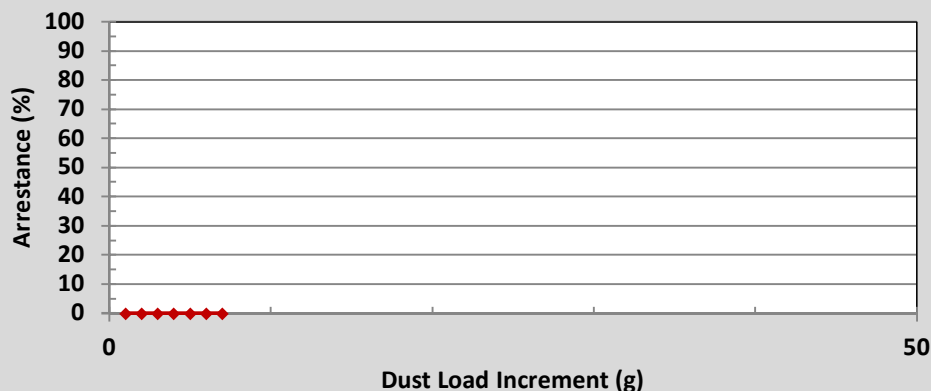
Resistance vs. Test Dust Captured



Arrestance Table

Arrestance (%)	Dust Load Increment (g)
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A
#VALUE!	N/A

Arrestance vs. Test Dust Captured



Note:

The results of this test relate only to the test device in the condition stated herein. The performance results cannot by themselves be quantitatively applied to predict filtration performance in all "real life" environments.

ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-2100-5893R	20-Oct-2020	Camfil USA	Don Thornburg

Fractional Efficiency Values							
i	d_i	d_{i+1}	d_m	$\Delta \ln d_i$	E_i	$E_{D,i}$	$E_{A,i}$
1	0.30	0.40	0.35	0.29	96%	96%	96%
2	0.40	0.55	0.47	0.32	98%	98%	98%
3	0.55	0.70	0.62	0.24	99%	99%	99%
4	0.70	1.00	0.84	0.36	100%	100%	100%
5	1.00	1.30	1.14	0.26	100%	100%	100%
6	1.30	1.60	1.44	0.21	100%	100%	100%
7	1.60	2.20	1.88	0.32	100%	100%	100%
8	2.20	3.00	2.57	0.31	100%	100%	100%
9	3.00	4.00	3.46	0.29	100%	100%	100%
10	4.00	5.50	4.69	0.32	100%	100%	100%
11	5.50	7.00	6.20	0.24	100%	100%	100%
12	7.00	10.00	8.37	0.36	100%	100%	100%

Symbols and Units	
d_i	Lower limit particle diameter in a size range i , μm
d_{i+1}	Upper limit particle diameter in a size range i , μm
d_m	Geometric mean diameter of a size range, μm
$\Delta \ln d_i$	Logarithmic width of a particle diameter size range i
E_i	Initial fractional efficiency of particle size range i of the untreated and unloaded filter element, %
$E_{D,i}$	Fractional efficiency of particle size range i of the conditioned filter element, %
$E_{A,i}$	Average fractional efficiency of particle size range i , %

ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-2100-5893R	20-Oct-2020	Camfil USA	Don Thornburg

Calculation of PM Efficiencies							ePM _{1,min}	ePM ₁
i	d _m	Δln d _i	q _{3u} (Urban Distribution)	q _{3u} *Δln d _i	E _{D,i} *q _{3u} Δln d _i	E _{A,i} *q _{3u} Δln d _i		
	μm	μm						
1	0.35	0.29	22.627%	0.065095	0.062455	0.062491		
2	0.47	0.32	19.891%	0.063343	0.061928	0.062076		
3	0.62	0.24	15.837%	0.038193	0.037777	0.037811		
4	0.84	0.36	11.522%	0.041097	0.040902	0.041097	98%	98%
	Sums:			0.207728	0.203062	0.203476		
5	1.14	0.26	8.503%	0.022309	0.022271	0.022309	ePM _{2,5, min}	ePM _{2.5}
6	1.44	0.21	7.618%	0.015817	0.015771	0.015817		
7	1.88	0.32	8.022%	0.025546	0.025501	0.025546	98%	99%
8	2.57	0.31	9.984%	0.030966	0.030931	0.030966		
	Sums:			0.302366	0.297535	0.298114		
i	d _m	Δln d _i	q _{3r} (Rural Distribution)	q _{3r} *Δln d _i		E _{A,i} *q _{3r} Δln d _i		
	μm	μm						
1	0.35	0.29	9.412%	0.027077		0.025994		
2	0.47	0.32	8.395%	0.026733		0.026198		
3	0.62	0.24	7.432%	0.017924		0.017745		
4	0.84	0.36	7.014%	0.025016		0.025016		
5	1.14	0.26	7.628%	0.020013		0.020013		
6	1.44	0.21	8.833%	0.018340		0.018340		
7	1.88	0.32	10.804%	0.034406		0.034406		
8	2.57	0.31	13.726%	0.042573		0.042573		
9	3.46	0.29	16.708%	0.048067		0.048067	ePM ₁₀	100%
10	4.69	0.32	19.542%	0.062233		0.062233		
11	6.20	0.24	21.671%	0.052261		0.052261		
12	8.37	0.36	23.143%	0.082545		0.082545		
	Sums:			0.457189		0.455392		