Camfil USA
1 North Corporate Drive
Riverdale, NJ 07457
(973) 616-7300

ASHRAE® 52.2-2012 Test Results w/Appendix J Results

Filter Description

Manufacturer	Filter Model	Filter Part Number
Camfil	**30/30 Dual 9**	**406331-005**

Filter Type	Media Type	Media Color	Media Area (ft^2)
PleatedPanel	**Polyester - Mechanical**	**Green/White**	**17**

Nominal Size	Actual Size						
HxWxD	Hgt (in)	Wid (in)	Dep (in)	Pleats/Pockets	UL Rating	LabFile	CrRef
24x24x2	**23 3/8**	**23 3/8**	**1 3/4**	**29**	**Yes**	**1481**	**1481**

ASHRAE® 52.2-2012

Time:	9:56:23	Date:	Jan 17, 2017
Test Number:	16206-007_00004487.047.aec		

Test Data	Test Results	Rated Values	
AirFlow (cfm)	1969	1970	
Nominal Vel (fpm)	492	493	
Initial ΔP (inWG)	0.26	0.30	
MERV	9	9	@1969cfm
E_1 (0.3-1.0µm), (%)	7	n/a	
E_2 (1.0-3.0µm), (%)	45	≥ 35	
E_3 (3.0-10µm), (%)	92	≥ 75	
Final DP, (inWG)	1.0	1.0	
Arrestance, (%)	93	8	
DHC, (g)	187		

Temp, (F)	75	Test Aerosol	KCl
RH, (%)	49	Loading Dust	ASHRAE

Comments

ASHRAE® 52.2-2012 w/App J

Time:	14:51:01	Date:	Jan 19, 2017
Test Number:	16206-012-KCL_00004507.047.aec		

Test Data	Test Results	Rated Values	
AirFlow (cfm)	1969	1970	
Nominal Vel (fpm)	492	493	
Initial ΔP (inWG)	0.26	0.30	
MERV-A	9A	9A	@1969cfm
E_1-A (0.3-1.0µm), (%)	6	n/a	
E_2-A (1.0-3.0µm), (%)	41	≥ 35	
E_3-A (3.0-10µm), (%)	87	≥ 75	
Final DP, (inWG)	1.0	1.0	
Arrestance-A, (%)	93	8	
DHC-A, (g)	199		

Temp, (F)	75	Test Aerosol	KCl
RH, (%)	48	Loading Dust	ASHRAE

Comments

Certified Test Per ASHRAE 52.2-2012

Approval: *Don Thornburg*
Electronic Signature, Original on file

Operator	Particle Counter	Model
AA	TSI	OPS 3330

Camfil Permission Required for Distribution

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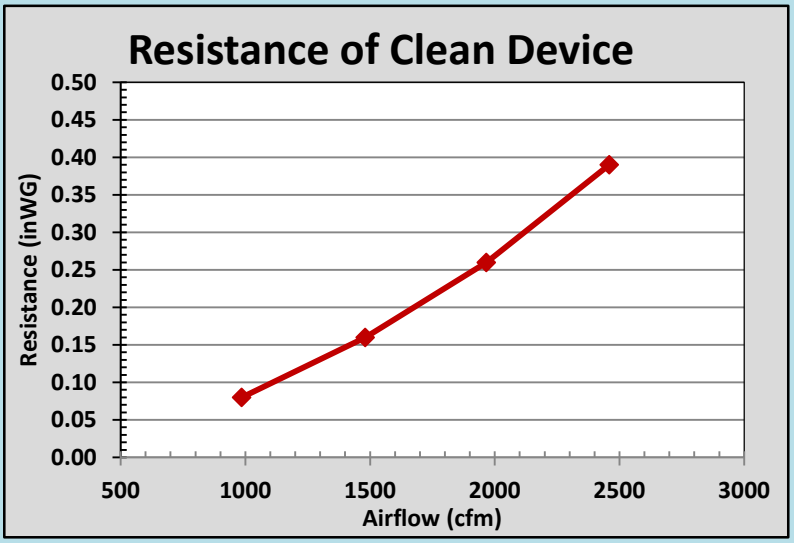
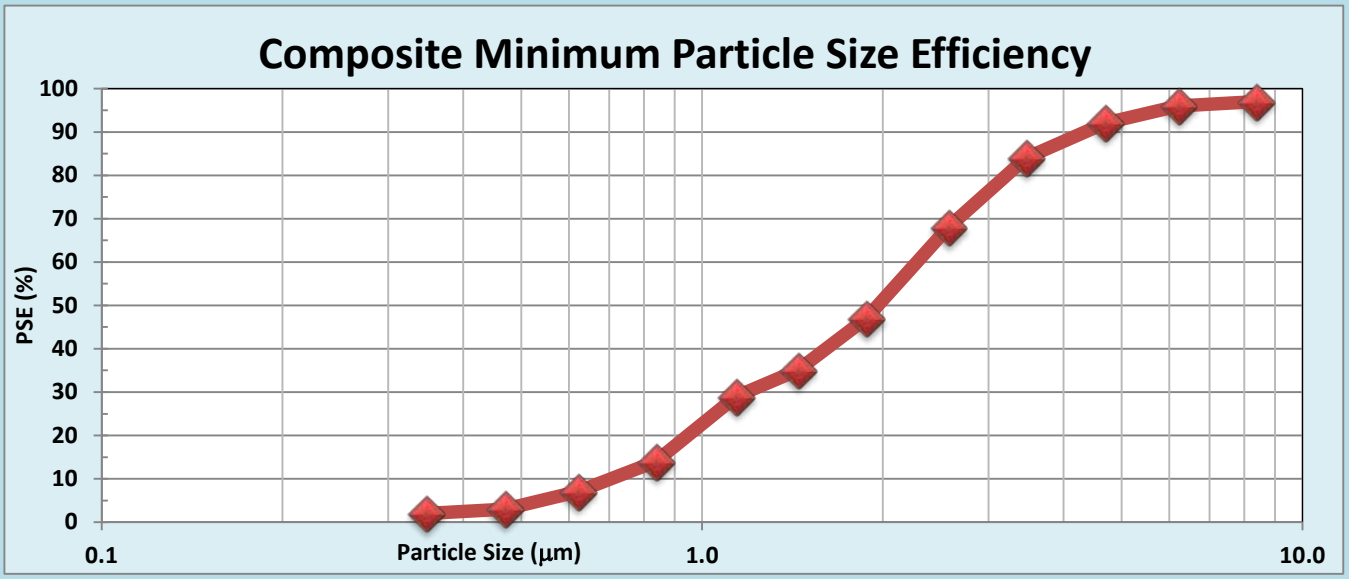
ASHRAE® 52.2-2012 Test Results

Date:	Jan 17, 2017	Test Number:	16206-007_00004487.047.aec

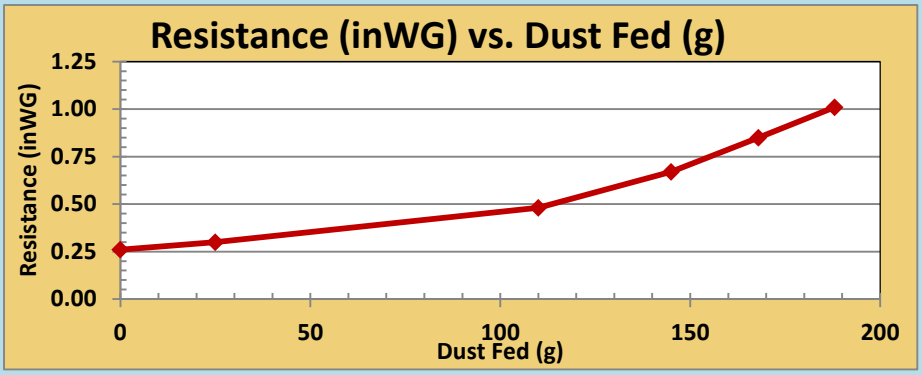
Manufacturer	Filter Model	Filter Part Number
Camfil	**30/30 Dual 9**	**406331-005**

Clean Resistance Table			
cfm	***m^3/s***	***inWG***	***Pa***
986	0.47	0.08	20
1481	0.70	0.16	40
1966	0.93	0.26	65
2459	1.16	0.39	97





ΔP (inWG)	Dust Fed (g)
0.26	**0**
0.30	**25**
0.48	**110**
0.67	**145**
0.85	**168**
1.01	**188**



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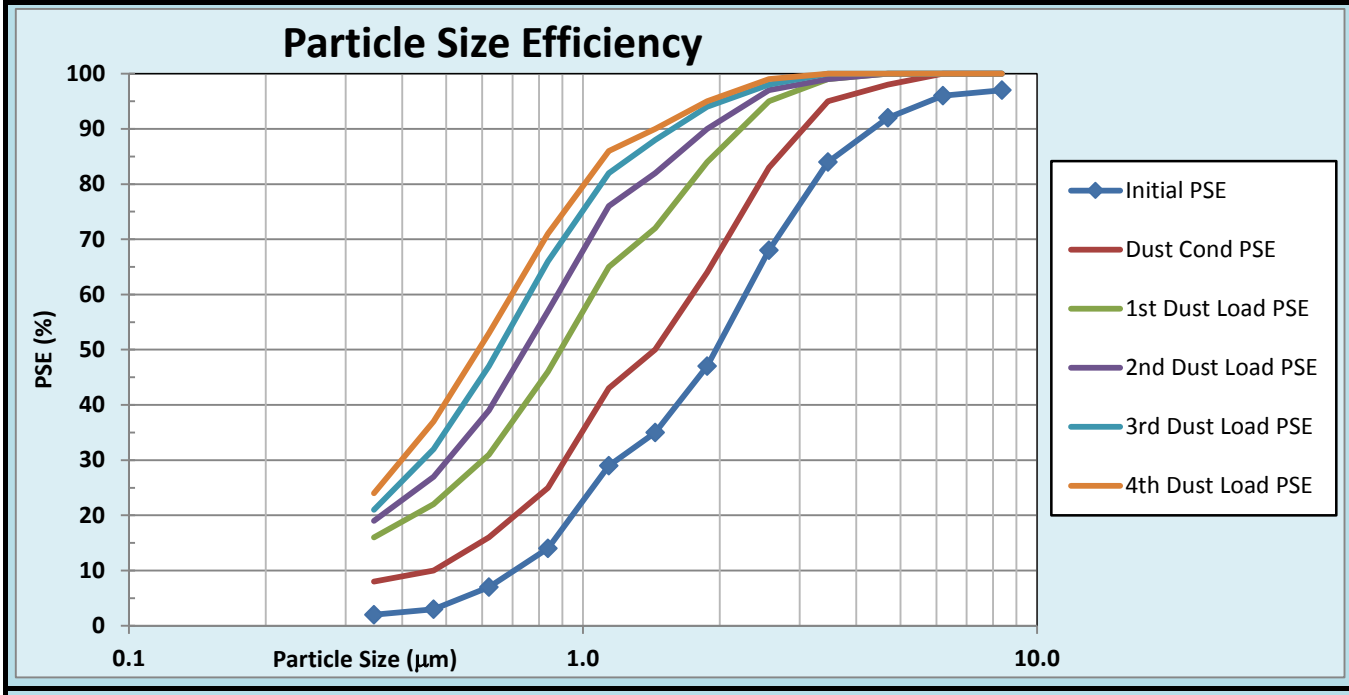
ASHRAE® 52.2-2012 Test Results

Date:	Jan 17, 2017	Test Number:	16206-007_00004487.047.aec
Manufacturer		Filter Model	Filter Part Number
Camfil		30/30 Dual 9	406331-005

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	**2**	**3**	**7**	**14**	**29**	**35**	**47**	**68**	**84**	**92**	**96**	**97**
Dust Cond PSE	**8**	**10**	**16**	**25**	**43**	**50**	**64**	**83**	**95**	**98**	**100**	**100**
1st Dust Load PSE	**16**	**22**	**31**	**46**	**65**	**72**	**84**	**95**	**99**	**100**	**100**	**100**
2nd Dust Load PSE	**19**	**27**	**39**	**57**	**76**	**82**	**90**	**97**	**99**	**100**	**100**	**100**
3rd Dust Load PSE	**21**	**32**	**47**	**66**	**82**	**88**	**94**	**98**	**100**	**100**	**100**	**100**
4th Dust Load PSE	**24**	**37**	**53**	**71**	**86**	**90**	**95**	**99**	**100**	**100**	**100**	**100**
Composite Min PSE	**2**	**3**	**7**	**14**	**29**	**35**	**47**	**68**	**84**	**92**	**96**	**97**



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. Test Reports without DHC values show efficiency only and the associated MERV value is a estimated value based on the single efficiency data shown. For more information, contact your local Camfil representative or distributor.

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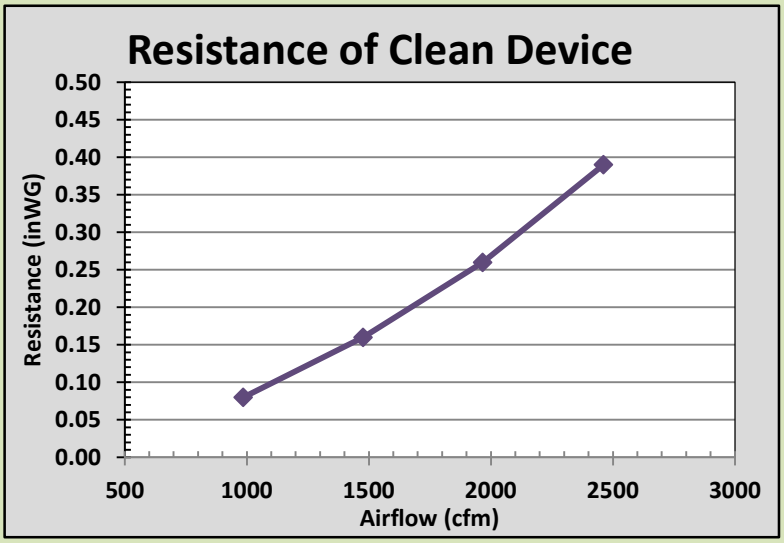
ASHRAE® 52.2-2012 Test Results w/ Appendix J Results

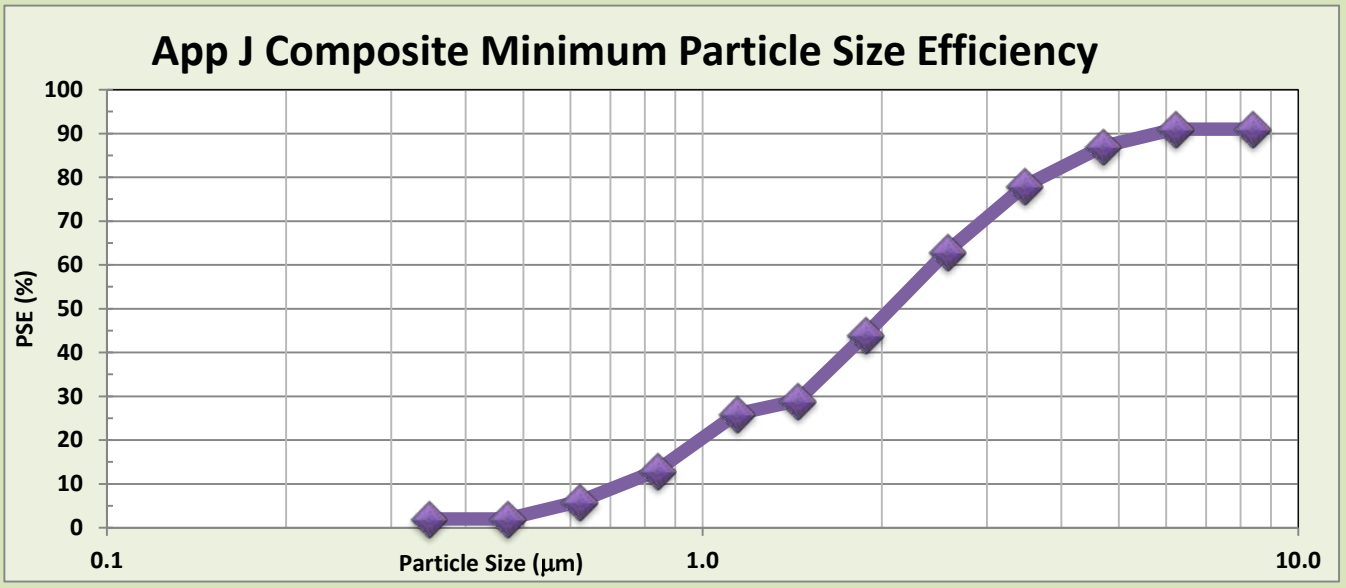
Date:	01/19/2017	Test Number:	16206-012-KCL_00004507.047.aec

Manufacturer	Filter Model	Filter Part Number
Camfil	**30/30 Dual 9**	**406331-005**

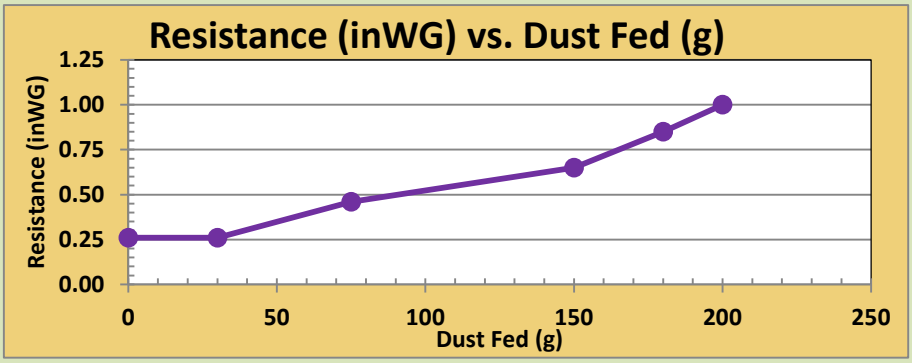
Clean Resistance Table

cfm	*m^3/s*	*inWG*	*Pa*
986	0.47	0.08	20
1476	0.70	0.16	40
1966	0.93	0.26	65
2462	1.16	0.39	97





ΔP (inWG)	Dust Fed (g)
0.26	**0**
0.26	**30**
0.46	**75**
0.65	**150**
0.85	**180**
1.00	**200**



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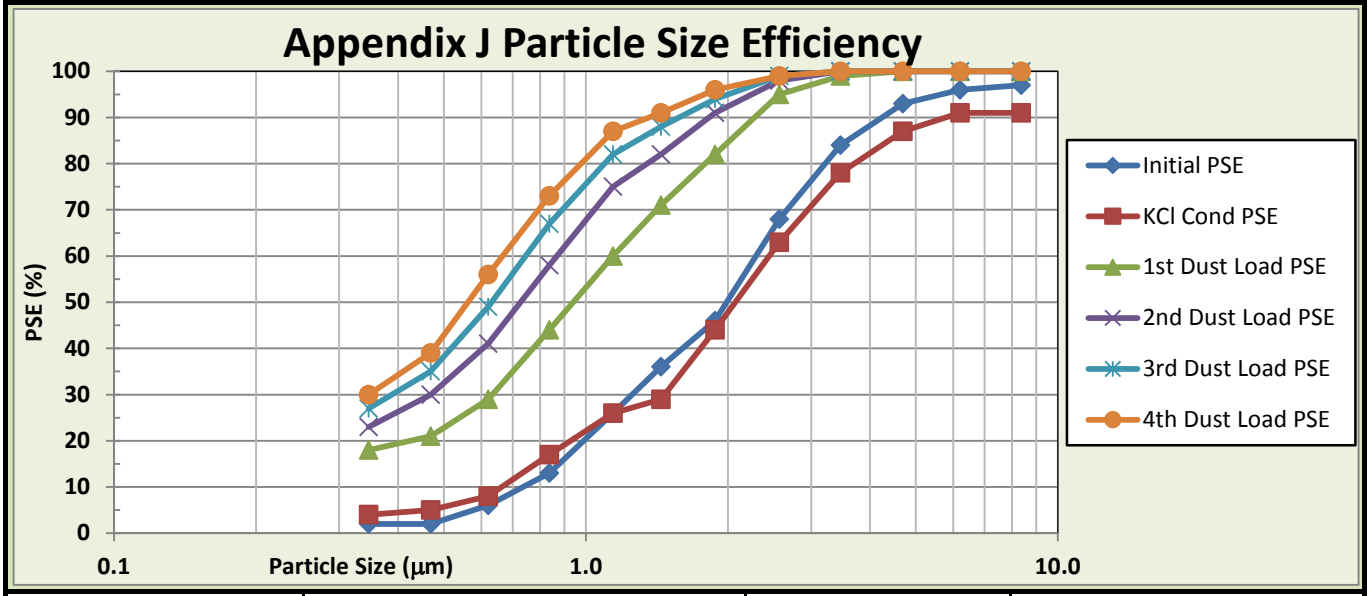
ASHRAE® 52.2-2012 Test Results w/ Appendix J Results

Date:	01/19/2017	Test Number:	16206-012-KCL_00004507.047.aec

Manufacturer	Filter Model	Filter Part Number
Camfil	**30/30 Dual 9**	**406331-005**

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	**2**	**2**	**6**	**13**	**26**	**36**	**46**	**68**	**84**	**93**	**96**	**97**
KCl Cond PSE	**4**	**5**	**8**	**17**	**26**	**29**	**44**	**63**	**78**	**87**	**91**	**91**
1st Dust Load PSE	**18**	**21**	**29**	**44**	**60**	**71**	**82**	**95**	**99**	**100**	**100**	**100**
2nd Dust Load PSE	**23**	**30**	**41**	**58**	**75**	**82**	**91**	**98**	**100**	**100**	**100**	**100**
3rd Dust Load PSE	**27**	**35**	**49**	**67**	**82**	**88**	**94**	**99**	**100**	**100**	**100**	**100**
4th Dust Load PSE	**30**	**39**	**56**	**73**	**87**	**91**	**96**	**99**	**100**	**100**	**100**	**100**
Composite Min PSE	**2**	**2**	**6**	**13**	**26**	**29**	**44**	**63**	**78**	**87**	**91**	**91**



Bkg Concentration (particles/cm^3)	Avg Cond Aerosol Conc (particles/cm^3)	Cumulative Cond Duration (minutes)	Cumulative Cond CT (particles-min/cm^3)
303.0	**1.51E+05**	**790**	**1.23E+08**

Large Particle Concentration (Particles ft^3)	Ratio Small to Large (>20,000)	Conditioning ΔP (inWG)		Same duct?
		Initial ΔP	Final ΔP	
30,000	**142,546**	**0.26**	**0.26**	**No**

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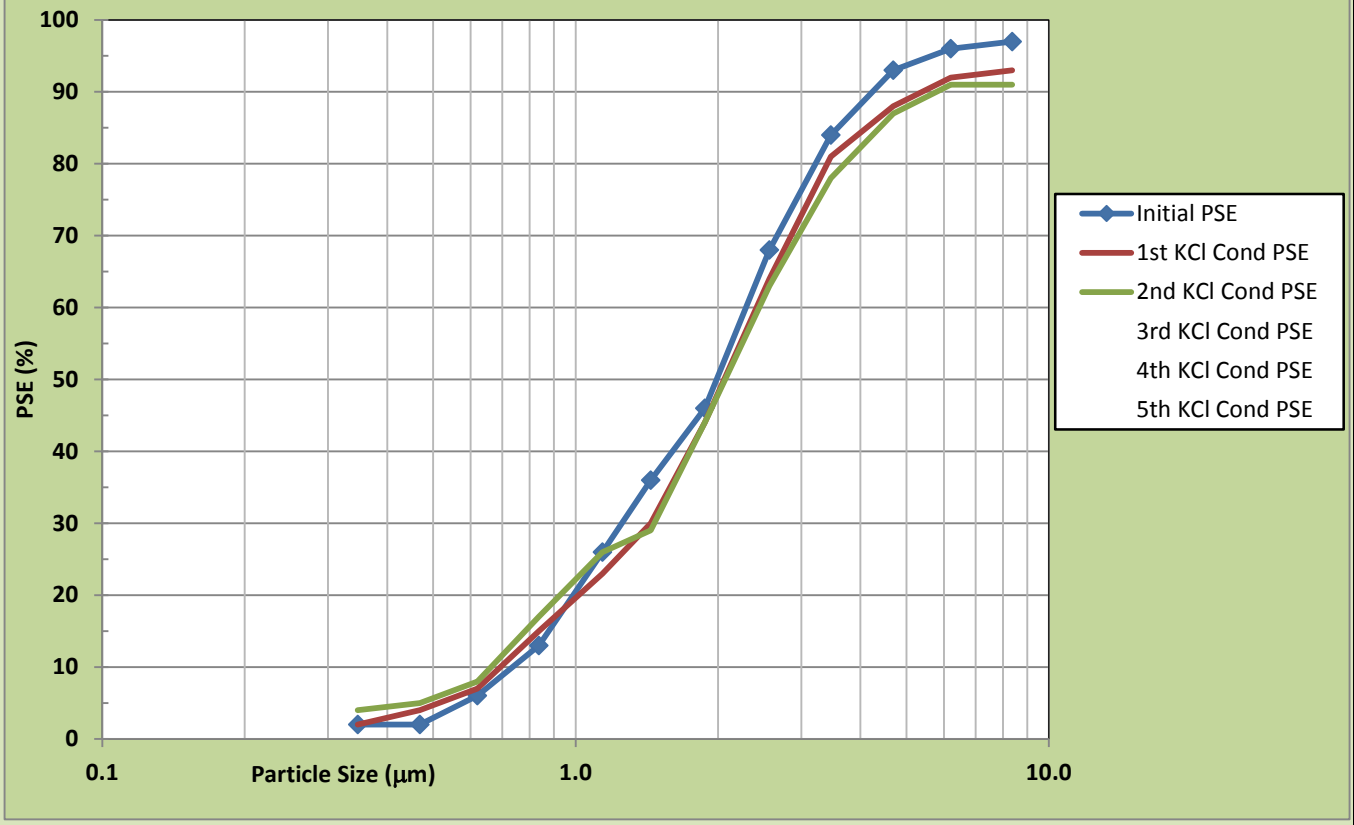
ASHRAE® 52.2-2012 Test Results w/ Appendix J Results

Date:	01/19/2017	Test Number:	16206-012-KCL_00004507.047.aec
Manufacturer		Filter Model	Filter Part Number
Camfil		**30/30 Dual 9**	**406331-005**

KCl 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	**2**	**2**	**6**	**13**	**26**	**36**	**46**	**68**	**84**	**93**	**96**	**97**
1st KCl Cond PSE	**2**	**4**	**7**	**15**	**23**	**30**	**44**	**64**	**81**	**88**	**92**	**93**
2nd KCl Cond PSE	**4**	**5**	**8**	**17**	**26**	**29**	**44**	**63**	**78**	**87**	**91**	**91**
3rd KCl Cond PSE												
4th KCl Cond PSE												
5th KCl Cond PSE												
Final KCl Cond PSE	**4**	**5**	**8**	**17**	**26**	**29**	**44**	**63**	**78**	**87**	**91**	**91**

KCl Conditioning Particle Size Efficiency



Camfil USA
1 N. Corporate Dr.
Riverdale, NJ 07457

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

Test Information

Report ID	Report Date	Test Requested by	Supervisor
USA-1585-4252R	7-Nov-2019	Manufacturer	Don Thornburg

Device Tested

Manufacturer	Model	Part Number	How Test Sample Obtained & Date	
Camfil USA	30/30 D9 2in	406331-005	Manufacturer Suplied	14-Aug-2017

Nom Size HxWxD (in)	Pleats/Pockets	Media Color	Media Charge	Media Adhesive
24x24x2	29	Green/White	None	None

Media Type	Media Area (ft^2)	Product Type	UL Rating
Dual Layer Polyester	17.2	Pleated panel	UL 900

Test Results Summary

Resistance to Airflow

Airflow (cfm)	Measured Resistance (inWG)	*Met Published value*	Rated Initial Resistance (inWG)
2001	0.32		0.30

Arrestance:	Initial:	62%	Average:	93%

Rated Final Resistance (inWG)	0.85
Test Dust Capacity (TDC) (g)	485

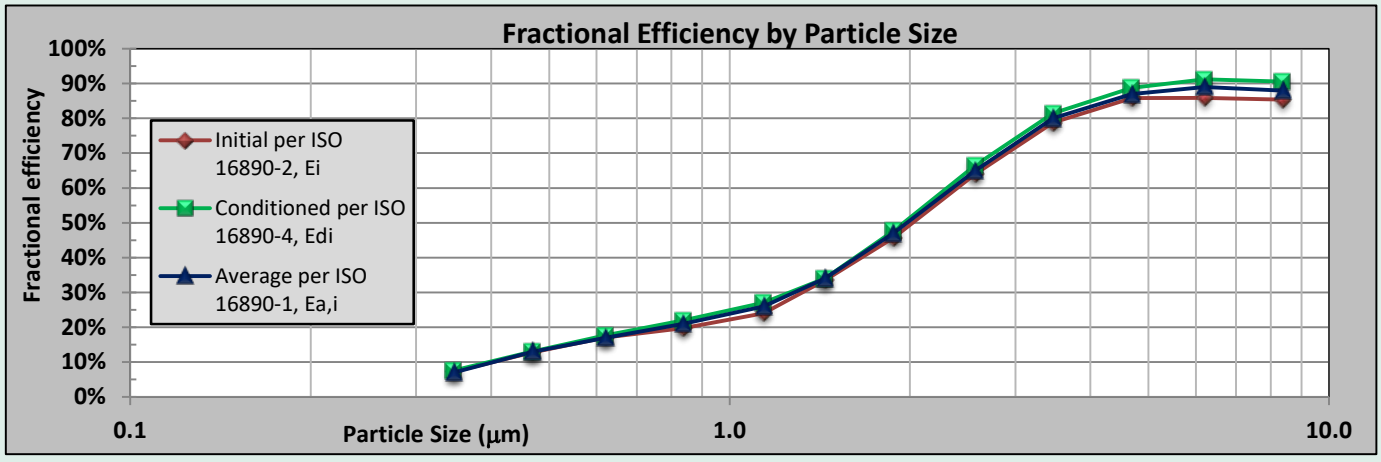
Fractional Efficiency and ISO Rating

Product Literature listed ISO 16890 Rating	*Met Published value*	ISO 16890 Rating
ISO ePM10 55%		ISO ePM10 60%

ePM 1	*ePM 1,min*	*ePM 2,5*	*ePM 2,5, min*	*ePM 10*
13%	14%	24%	24%	61%

Test Information and Included Reports

Test Type	Test ID	Test Date	Test Time	Test Operator
Initial per ISO 16890-2	USA-1585-4252	7-Nov-2019	1:15	A. Acain
Conditioned per ISO 16890-4	USA-1585-4256	8-Nov-2019	9:29	A. Acain
Dust Loaded per 16890-3	USA-1585-4271	14-Nov-2019	10:09	A. Acain



Approvals

camfil	Certified Test Per ISO ISO 16890-1:2016 *Don Thornburg, R&D Manager* Electronic Signature, Original on file	Test Organization	Camfil USA 1 N. Corporate Dr. Riverdale, NJ 07457 (973) 616-7300

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.*

Camfil USA
1 N. Corporate Dr.
Riverdale, NJ 07457

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

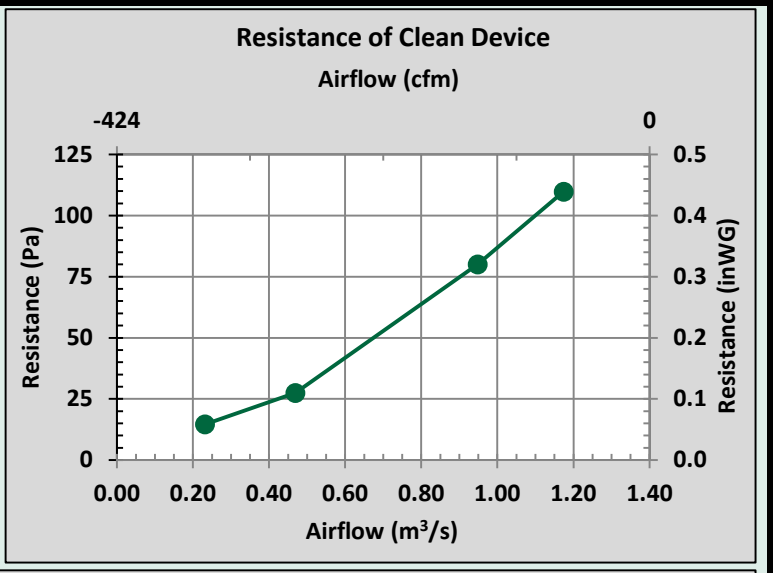
Test Information

Report ID	Report Date	Test Organization	Supervisor
USA-1585-4252R	7-Nov-2019	Camfil USA	Don Thornburg

Clean Resistance Table at 1.2kg/m^3

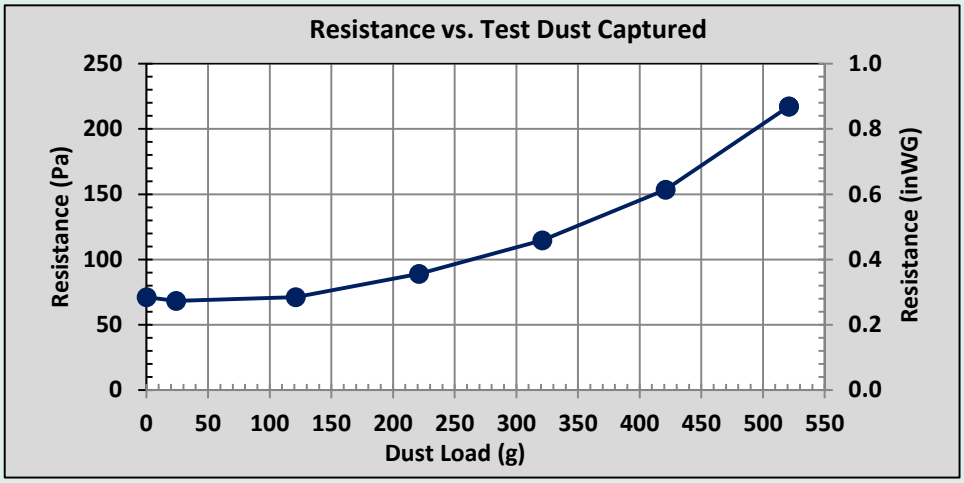
Test Airflow			Resistance	
% Rated	*m^3/s*	*cfm*	*Pa*	*inWG*
25%	0.23	500	15	0.05
50%	0.47	1000	27	0.11
100%	0.95	2000	80	0.31
125%	1.17	2500	110	0.44

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



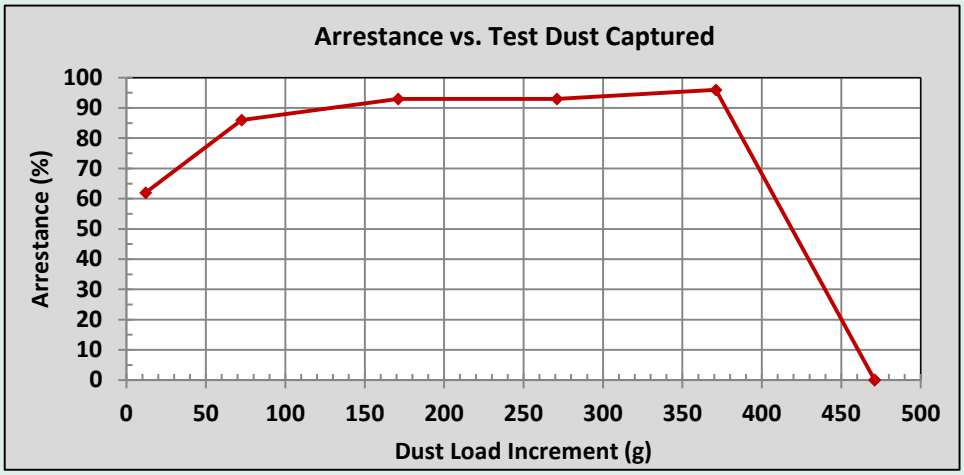
Dust Captured Table

Resistance to Airflow		Dust Load (g)
Pa	inWG	
71	0.29	0
68	0.27	24
71	0.29	121
89	0.36	221
115	0.46	321
154	0.62	421
217	0.87	521
N/A	N/A	N/A



Arrestance Table

Arrestance (%)	Dust Load Increment (g)
62	12
86	73
93	171
93	271
96	371
#VALUE!	471
#VALUE!	N/A



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.*

Camfil USA
1 N. Corporate Dr.
Riverdale, NJ 07457

ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-1585-4252R	**7-Nov-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	7%	8%	7%
2	0.40	0.55	**0.47**	0.32	13%	13%	13%
3	0.55	0.70	**0.62**	0.24	17%	18%	17%
4	0.70	1.00	**0.84**	0.36	20%	22%	21%
5	1.00	1.30	**1.14**	0.26	24%	27%	26%
6	1.30	1.60	**1.44**	0.21	33%	34%	34%
7	1.60	2.20	**1.88**	0.32	46%	48%	47%
8	2.20	3.00	**2.57**	0.31	64%	66%	65%
9	3.00	4.00	**3.46**	0.29	79%	81%	80%
10	4.00	5.50	**4.69**	0.32	86%	89%	87%
11	5.50	7.00	**6.20**	0.24	86%	91%	89%
12	7.00	10.00	**8.37**	0.36	85%	91%	88%

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* , %

Camfil USA
1 N. Corporate Dr.
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ISO 16890-1:2016 - Results Calculations

Report ID	Report Date	Test Organization	Supervisor
USA-1585-4252R	**7-Nov-2019**	**Camfil USA**	**Don Thornburg**

Calculation of PM Efficiencies

i	d_m µm	$\Delta\ln d_i$ µm	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
1	**0.35**	0.29	22.627%	0.065095	0.004933	0.004557		
2	**0.47**	0.32	19.891%	0.063343	0.008262	0.008235		
3	**0.62**	0.24	15.837%	0.038193	0.006746	0.006493		
4	**0.84**	0.36	11.522%	0.041097	0.009022	0.008630	***14%***	***13%***
			Sums:	**0.207728**	**0.028964**	**0.027915**		
5	**1.14**	0.26	8.503%	0.022309	0.006039	0.005800		
6	**1.44**	0.21	7.618%	0.015817	0.005385	0.005378	$ePM_{2,5,min}$	$ePM_{2.5}$
7	**1.88**	0.32	8.022%	0.025546	0.012182	0.012007		
8	**2.57**	0.31	9.984%	0.030966	0.020583	0.020128	***24%***	***24%***
			Sums:	**0.302366**	**0.073154**	**0.071227**		

i	d_m µm	$\Delta\ln d_i$ µm	q_{3r} *(Rural Distribution)*	$q_{3r}*\Delta\ln d_i$		$E_{A,i}*q_{3r}*\Delta\ln d_i$	ePM_{10}
1	**0.35**	0.29	9.412%	0.027077		0.001895	
2	**0.47**	0.32	8.395%	0.026733		0.003475	
3	**0.62**	0.24	7.432%	0.017924		0.003047	
4	**0.84**	0.36	7.014%	0.025016		0.005253	
5	**1.14**	0.26	7.628%	0.020013		0.005203	
6	**1.44**	0.21	8.833%	0.018340		0.006236	
7	**1.88**	0.32	10.804%	0.034406		0.016171	
8	**2.57**	0.31	13.726%	0.042573		0.027672	
9	**3.46**	0.29	16.708%	0.048067		0.038454	
10	**4.69**	0.32	19.542%	0.062233		0.054143	
11	**6.20**	0.24	21.671%	0.052261		0.046513	***61%***
12	**8.37**	0.36	23.143%	0.082545		0.072639	
			Sums:	**0.457189**		**0.280702**	

