

Lindbergs Ventilation AB  
Västkustvägen 400  
254 77 FLENINGE

## Testing of Air Filter according to EN779:2012

(4 appendices)

An annual test according to CR055 (Certification rules for air filters) has been performed according to EN 779:2012.

### Tested items

Lindbergs Ventilation AB, Art No: 700163M08, F7 592x592x635-8/25, F7, 592 mm x 592 mm x 635 mm, 8 pocket air filter.

Lindbergs Ventilation AB, Art No: 700163M08, F7 592x592x635-8/25, F7, filter media samples for discharging test.

Pictures can be found in appendix 2.

The items were collected by SP on September 16, 2015 from the production at Lindbergs Ventilation AB.

The items were without visible defects.

### Date and Place

The test was carried out at SP's laboratory of Energy and bioeconomy in Borås, Sweden on October 20-21, 2015. Discharging test was carried out on November 2-3, 2015.

### Test method

The test was carried out according to standard EN 779:2012 "Particulate air filters for general ventilation – Determination of the filtration performance".

Additional to the test, an energy calculation was performed according to EUROVENT 4/21 - 2014 "Calculation method for the energy use related to air filters in general ventilation systems". The calculation is not covered by the accreditation.

### Results

The results are presented in appendix 1 and 4 and are valid only for the items tested.

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#### SP Technical Research Institute of Sweden

Postal address  
SP  
Box 857  
SE-501 15 BORÅS  
Sweden

Office location  
Västeråsen  
Brinellgatan 4  
SE-504 62 BORÅS

Phone / Fax / E-mail  
+46 10 516 50 00  
+46 33 13 55 02  
info@sp.se

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## Measurement equipment

- Pressure gauge Furness model 318, SP's inventory no. 901 568 (static P Filter)
- Pressure gauge Furness model 318, SP's inventory no. 901 569 (static P Flow)
- Pressure gauge Furness FC012, SP's inventory no. 201 691 ( $\Delta P$  Filter)
- Pressure gauge Furness FC012, SP's inventory no. 201 690 ( $\Delta P$  Flow)
- Particle counter Las-X II, SP's inventory no. 701 378
- Barometer, Testo 511, SP's inventory no. 900 078
- Temperature and RH, Testo 635, SP's inventory no. 900 065
- Weighing scale, Mettler PC16, SP's inventory no. 202 741
- Flow meter, MFS-C-250, SP's inventory no. 202 742
- Flow meter, MFS-C-50, SP's inventory no. 202 190

## Uncertainty of measurement

The uncertainty of the Air flow is better than  $\pm 5 \%$

The uncertainty of the Pressure Drop is better than  $\pm 3 \%$

The uncertainty of the Temperature is better than  $\pm 0.5 \text{ }^\circ\text{C}$

The uncertainty of the Relative Humidity is better than  $\pm 3 \%$  RH

The uncertainty of the Atmospheric Pressure is better than  $\pm 1 \text{ mbar}$

The uncertainty of the Measured mass is better than  $\pm 0.5 \text{ g}$

The uncertainty has been calculated according to EA-4/16 with a coverage factor  $k=2$ .

The method error in determination of the filtration efficiency is:

$\eta = 0\text{-}90 \%$ :  $\pm 0.1$  of penetration value [%]

$\eta = 90\text{-}99 \%$ :  $\pm 0.2$  of penetration value [%]

$\eta = 99\text{-}99.99 \%$ :  $\pm 0.5$  of penetration value [%]

$\eta > 99.99 \%$ :  $\pm 1$  of penetration value [%]

The uncertainty of the filtration efficiency according to EN 779:2012 is presented in the appendix.

## SP Technical Research Institute of Sweden Energy and bioeconomy - Urban Supply Systems

Performed by

Examined by

Ulf Hultman

Markus Alsbjör

## Appendices

1. Test report according to EN779:2012
2. Picture of tested item
3. Interpretation of test reports according to section 13.2 in EN779:2012
4. Energy calculation according to Eurovent 4/21-2014

Appendix 1

Testing organisation: SP Technical Research Institute of Sweden Report no.: 5P07627A

**EN 779:2012 AIR FILTER RESULTS**

GENERAL

Test no.: SP201510201	Date of test: 20/10/2015 - 21/10/2015	Supervisor: UH
Test requested by: Lindbergs Ventilation AB	Device receiving date	
Device delivered by: Lindbergs Ventilation AB	16/9/2015	

DEVICE TESTED

Model: Art No 700163M08, F7 592x592x635-8/25	Manufacturer: Lindbergs Ventilation AB	Construction: Pocket filter, 8 pockets
Type of media: Glass	Net effective filtering area: 6.0 m <sup>2</sup>	Filter dimensions (width x height x depth): 592 mm x 592 mm x 635 mm

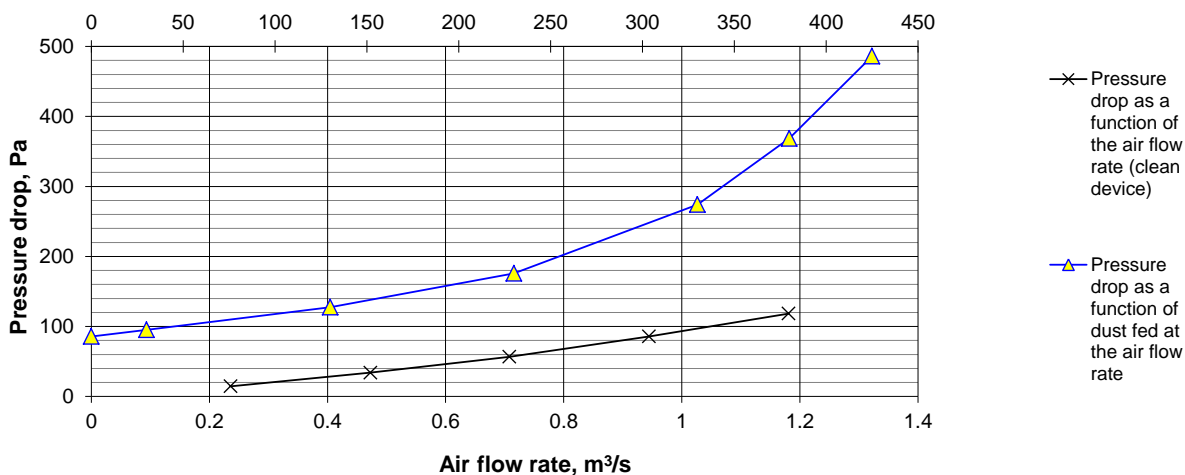
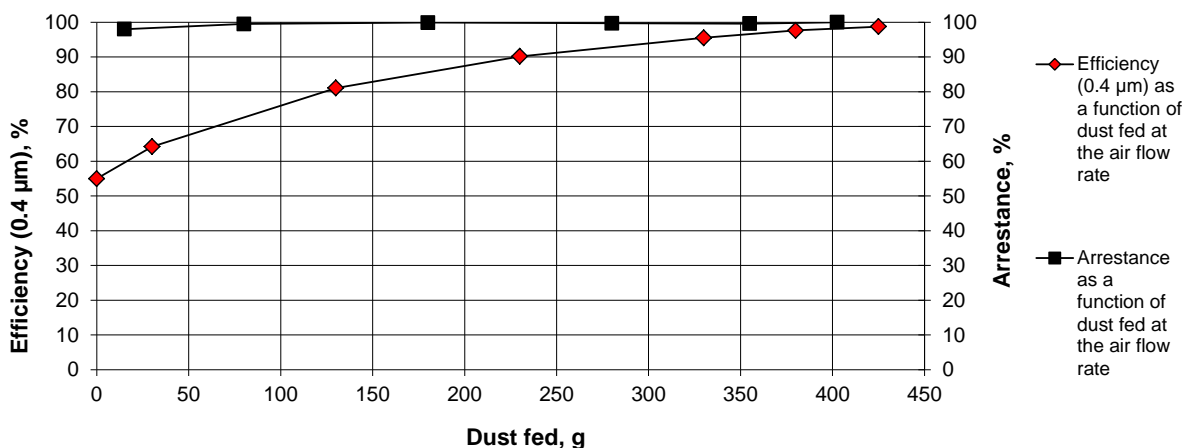
TEST DATA

Test air flow rate: 0.944 m <sup>3</sup> /s	Test air temperature: 22 to 23 °C	Test air relative humidity: 35 to 43 %	Test aerosol: DEHS	Loading dust: ASHRAE 52/76
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RESULTS

Initial pressure drop: 86 Pa	Initial arrestance: 98 %	Initial efficiency (0.4 µm): 55 %	Test dust capacity: 305 / 369 / 410 g	Untreated/ discharged efficiency of media (0.4 µm): 57% / 46%
Final test pressure drop: 250 / 350 / 450 Pa	Average arrestance: >99% / >99% / >99%	Average efficiency (0.4 µm): 80% / 83% / 85%	Filter class (450 Pa): F7	Remarks:

Note: The performance results are only valid for the tested item and cannot by themselves be quantitatively applied to predict efficiency and lifetime in service



Appendix 1

**EN779:2012 - Efficiency after different dust loading phases**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s

Particle size		Efficiency %									
Interval µm	Mean µm	Pressure drop, Pa and Dust fed, g									
		86 Pa 0 g	95 Pa 30 g	128 Pa 130 g	176 Pa 230 g	274 Pa 330 g	369 Pa 380 g				
0.10 - 0.12	0.11	43.4 ± 3.8	51.8 ± 3.7	68.3 ± 2.0	77.5 ± 1.6	87.3 ± 0.8	89.7 ± 5.3				
0.12 - 0.15	0.13	35.3 ± 2.3	45.8 ± 1.8	64.9 ± 1.2	76.9 ± 0.5	86.3 ± 0.7	91.1 ± 0.7				
0.15 - 0.20	0.17	35.7 ± 2.0	45.8 ± 1.8	65.2 ± 1.4	77.8 ± 0.5	87.1 ± 0.6	91.8 ± 0.7				
0.20 - 0.25	0.22	38.2 ± 2.0	48.4 ± 1.9	67.0 ± 1.0	80.0 ± 0.8	89.4 ± 0.5	93.6 ± 0.3				
0.25 - 0.35	0.30	44.5 ± 1.1	55.0 ± 0.8	72.8 ± 0.5	85.0 ± 0.4	92.3 ± 0.5	95.3 ± 0.4				
0.35 - 0.45	0.40	55.0 ± 1.5	64.2 ± 1.8	81.1 ± 0.7	90.2 ± 0.4	95.5 ± 0.4	97.6 ± 0.2				
0.45 - 0.60	0.52	65.1 ± 1.0	74.0 ± 0.9	87.5 ± 0.7	94.2 ± 0.4	97.8 ± 0.2	99.0 ± 0.2				
0.60 - 0.75	0.67	72.8 ± 2.4	80.4 ± 2.3	92.1 ± 0.7	96.8 ± 0.4	98.8 ± 0.3	99.4 ± 0.1				
0.75 - 1.00	0.87	80.5 ± 1.0	87.2 ± 0.9	95.5 ± 0.6	98.4 ± 0.2	99.5 ± 0.1	99.6 ± 0.1				
1.00 - 1.50	1.22	86.5 ± 1.6	92.2 ± 1.0	97.8 ± 0.4	98.9 ± 0.2	99.9 ± 0.1	100.0 ± 0.1				
1.50 - 2.00	1.73	93.3 ± 0.5	96.8 ± 0.7	99.2 ± 0.3	99.8 ± 0.1	99.9 ± 0.1	99.9 ± 0.1				
2.00 - 3.00	2.45	98.3 ± 0.7	99.2 ± 0.8	99.9 ± 0.1	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.1				

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

Particle size		Efficiency %			
Interval µm	Mean µm	Pressure drop, Pa and Dust fed, g			
		486 Pa 425 g			
0.10 - 0.12	0.11	94.4 ± 1.6			
0.12 - 0.15	0.13	94.6 ± 0.2			
0.15 - 0.20	0.17	95.0 ± 0.3			
0.20 - 0.25	0.22	96.2 ± 0.1			
0.25 - 0.35	0.30	97.4 ± 0.1			
0.35 - 0.45	0.40	98.7 ± 0.2			
0.45 - 0.60	0.52	99.5 ± 0.1			
0.60 - 0.75	0.67	99.8 ± 0.1			
0.75 - 1.00	0.87	99.9 ± 0.1			
1.00 - 1.50	1.22	99.9 ± 0.1			
1.50 - 2.00	1.73	100.0 ± 0.0			
2.00 - 3.00	2.45	99.9 ± 0.1			

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

Appendix 1

**EN779:2012 - Average efficiency at different final test pressure drops**

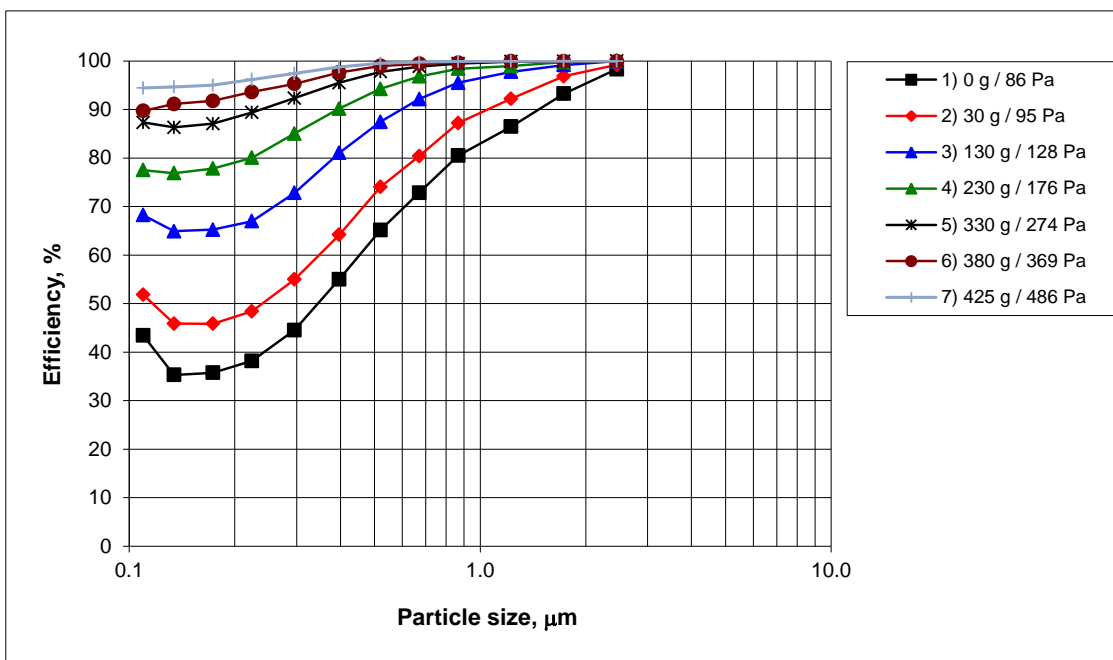
Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s

Particle size		Average efficiency %			
Interval µm	Mean µm	Final test pressure drop			
		250 Pa	350 Pa	450 Pa	Pa
0.10 - 0.12	0.11	68.2 ± 2.7	71.6 ± 2.6	73.5 ± 2.5	
0.12 - 0.15	0.13	65.1 ± 1.3	69.0 ± 1.1	71.3 ± 1.0	
0.15 - 0.20	0.17	65.6 ± 1.3	69.5 ± 1.1	71.8 ± 1.0	
0.20 - 0.25	0.22	67.7 ± 1.3	71.7 ± 1.1	73.9 ± 1.0	
0.25 - 0.35	0.30	73.2 ± 0.7	76.7 ± 0.6	78.6 ± 0.5	
0.35 - 0.45	0.40	80.3 ± 0.9	83.1 ± 0.8	84.6 ± 0.7	
0.45 - 0.60	0.52	86.5 ± 0.7	88.6 ± 0.6	89.6 ± 0.5	
0.60 - 0.75	0.67	90.7 ± 1.1	92.2 ± 0.9	92.9 ± 0.8	
0.75 - 1.00	0.87	94.2 ± 0.6	95.2 ± 0.5	95.6 ± 0.4	
1.00 - 1.50	1.22	96.6 ± 0.5	97.2 ± 0.4	97.4 ± 0.4	
1.50 - 2.00	1.73	98.6 ± 0.4	98.9 ± 0.3	99.0 ± 0.3	
2.00 - 3.00	2.45	99.7 ± 0.3	99.8 ± 0.2	99.8 ± 0.2	
Test dust capacity		305 g	369 g	410 g	
NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.					

Appendix 1

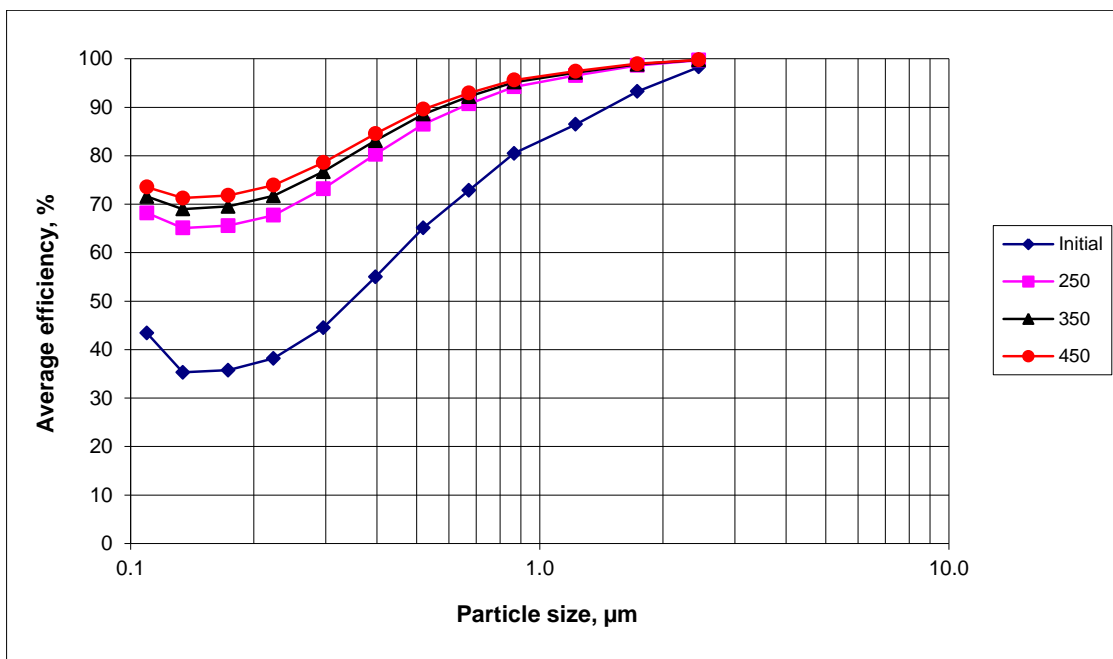
**EN779:2012 - Efficiency after different dust loading phases**

Air Filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s



**EN779:2012 - Initial and average efficiency at different final test pressure drops**

Air Filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s



Appendix 1

**EN779:2012 - Air flow rate and pressure drop after different dust loading phases**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s

Date	Dust fed m <sub>tot</sub> g	Air flow meter				Filter						
		t <sub>f</sub> °C	p <sub>sf</sub> Pa	dp <sub>f</sub> Pa	q <sub>m</sub> kg/s	t °C	φ %	p <sub>a</sub> kPa	ρ kg/m <sup>3</sup>	q <sub>v</sub> m <sup>3</sup> /s	Δp Pa	Δp <sub>1.20</sub> Pa
Clean filter												
20/10/2015	0	22.5	-67	32	0.28	22.5	36.1	99.9	1.173	0.236	15	15
20/10/2015	0	22.4	-152	128	0.55	22.4	36.4	99.8	1.172	0.473	34	34
20/10/2015	0	22.3	-261	286	0.83	22.3	36.6	99.7	1.171	0.708	57	57
20/10/2015	0	22.0	-398	508	1.11	22.0	36.8	99.6	1.171	0.944	86	86
20/10/2015	0	22.9	-570	789	1.38	22.9	34.9	99.4	1.165	1.181	118	118
Clean filter pressure drop is proportional to (q <sub>v</sub> ) <sup>n</sup> , where n = 1.2956												
Dust loading phase												
20/10/2015	30	22.9	-402	506	1.101	22.9	43.3	99.5	1.165	0.945	95	95
20/10/2015	30	22.5	-392	507	1.103	22.5	39.9	99.5	1.168	0.945	96	96
21/10/2015	130	22.7	-389	503	1.095	22.7	41.3	99.0	1.160	0.944	127	128
21/10/2015	130	22.6	-388	504	1.097	22.6	40.6	99.0	1.161	0.945	126	127
21/10/2015	230	22.5	-377	504	1.097	22.5	39.8	99.0	1.161	0.944	175	176
21/10/2015	230	22.6	-380	504	1.097	22.6	39.3	99.0	1.161	0.945	173	174
21/10/2015	330	22.6	-358	504	1.097	22.6	39.8	99.0	1.161	0.944	273	274
21/10/2015	330	22.4	-353	504	1.097	22.4	40.6	99.0	1.162	0.944	269	270
21/10/2015	380	22.8	-342	504	1.097	22.8	39.4	99.0	1.161	0.945	367	369
21/10/2015	380	22.4	-344	504	1.097	22.4	40.5	99.0	1.162	0.944	362	364
21/10/2015	425	22.7	-281	504	1.097	22.7	39.8	99.0	1.161	0.945	484	486
21/10/2015	425	22.4	-280	504	1.097	22.4	40.1	99.0	1.162	0.944	479	481

2 = after dust increment  
 1 = before next dust increment

Symbols and units

- dp<sub>f</sub> air flow meter differential pressure, Pa
- m<sub>tot</sub> cumulative mass of dust fed to filter, g
- Δp measured filter pressure drop, Pa
- Δp<sub>1.20</sub> filter pressure drop at air density 1.20 kg/m<sup>3</sup>, Pa
- p<sub>a</sub> absolute air pressure upstream of filter, kPa
- p<sub>sf</sub> air flow meter static pressure, kPa
- q<sub>m</sub> mass flow rate, kg/s
- q<sub>v</sub> air flow rate filter, m<sup>3</sup>/s
- t<sub>f</sub> temperature at air flow meter, °C
- t temperature upstream of filter, °C
- φ relative humidity upstream of the filter, %
- ρ air density upstream of filter, kg/m<sup>3</sup>

Appendix 1

**EN779:2012 - Pressure drop and arrestance after different dust loading phases**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201510201  
 Test aerosol: DEHS  
 Air flow rate: 0.944 m<sup>3</sup>/s

Date	$\Delta p_1$	dm	m <sub>tot</sub>	$\Delta p_2$	m <sub>1</sub>	m <sub>2</sub>	$\Delta m$	m <sub>d</sub>	A	A <sub>m</sub>
	Pa	g	g	Pa	g	g	g	g	%	%
20/10/2015	86	30	30	95	2343.4	2344.0	0.6	0.0	98.0	98.0
21/10/2015	96	100	130	128	2344.0	2344.5	0.5	0.0	99.5	99.2
21/10/2015	127	100	230	176	2344.5	2344.6	0.1	0.0	99.9	99.5
21/10/2015	174	100	330	274	2344.6	2344.9	0.3	0.0	99.7	99.5
21/10/2015	270	50	380	369	2344.9	2345.1	0.2	0.0	99.6	99.6
21/10/2015	364	45	425	486	2345.1	2344.9	-0.2	0.0	100.0	99.6

Symbols and units

- A arrestance, %
- A<sub>m</sub> average arrestance, %
- dm dust increment, g
- $\Delta p_1$  pressure drop before dust increment (air density 1.20 kg/m<sup>3</sup>), Pa
- $\Delta p_2$  pressure drop after dust increment (air density 1.20 kg/m<sup>3</sup>), Pa
- m<sub>d</sub> dust in duct after device, g
- m<sub>1</sub> mass of final filter before dust increment
- m<sub>2</sub> mass of final filter after dust increment
- m<sub>tot</sub> cumulative mass of dust fed to filter, g
- $\Delta m$  mass gain of final filter, g

**Mass of tested item:**

Clean filter:	2 075.7 g
After complete test:	2 484.7 g

**Test dust**

ASHRAE 52/76, Particle Technology Ltd.  
 Batch no: 8326, 09/01/14



Appendix 1

**EN779:2012 - Efficiency and pressure drop of untreated filter material at 100 % nominal velocity**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201511022  
 Test aerosol: DEHS  
 Discharging method: Isopropanol  
 Air flow rate: 14.5 l/s  
 Media velocity: 0.16 m/s  
 Size of material sample: 9.24 dm<sup>2</sup>

Particle size µm		Sample 1	Sample 2	Sample 3	Average
		Efficiency %			
Interval	Mean	Pressure drop			
		56 Pa	56 Pa	53 Pa	55 Pa
0.10 - 0.12	0.11	30.3 ± 18.3	55.4 ± 7.8	43.4 ± 12.3	43.0
0.12 - 0.15	0.13	39.0 ± 2.2	39.3 ± 4.8	37.4 ± 2.7	38.5
0.15 - 0.20	0.17	38.3 ± 3.7	40.5 ± 2.6	36.8 ± 2.1	38.5
0.20 - 0.25	0.22	42.5 ± 1.8	43.2 ± 3.6	39.2 ± 1.9	41.6
0.25 - 0.35	0.30	47.2 ± 1.5	47.8 ± 1.7	45.2 ± 1.4	46.7
0.35 - 0.45	0.40	58.8 ± 1.3	58.5 ± 1.7	54.1 ± 1.7	57.1
0.45 - 0.60	0.52	67.5 ± 1.8	68.4 ± 1.5	63.7 ± 1.5	66.5
0.60 - 0.75	0.67	74.0 ± 0.8	76.6 ± 1.5	70.5 ± 1.1	73.7
0.75 - 1.00	0.87	82.0 ± 2.3	83.2 ± 1.0	78.2 ± 2.0	81.2
1.00 - 1.50	1.22	87.3 ± 2.1	90.5 ± 1.8	86.5 ± 1.7	88.1
1.50 - 2.00	1.73	93.3 ± 1.6	93.9 ± 1.1	90.1 ± 1.5	92.4
2.00 - 3.00	2.45	98.8 ± 1.9	98.4 ± 1.8	97.2 ± 1.5	98.1

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

**EN779:2012 - Efficiency and pressure drop of discharged filter material at 100 % nominal velocity**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201511022  
 Test aerosol: DEHS  
 Discharging method: Isopropanol  
 Air flow rate: 14.5 l/s  
 Media velocity: 0.16 m/s  
 Size of material sample: 9.24 dm<sup>2</sup>

Particle size µm		Sample 1	Sample 2	Sample 3	Average
		Efficiency %			
Interval	Mean	Pressure drop			
		50 Pa	51 Pa	47 Pa	49 Pa
0.10 - 0.12	0.11	38.4 ± 5.3	47.4 ± 13.9	36.6 ± 13.8	40.8
0.12 - 0.15	0.13	32.9 ± 2.0	32.1 ± 1.8	30.6 ± 2.1	31.9
0.15 - 0.20	0.17	33.2 ± 2.9	32.5 ± 1.7	29.7 ± 2.1	31.8
0.20 - 0.25	0.22	34.0 ± 1.5	33.1 ± 1.9	29.3 ± 2.5	32.1
0.25 - 0.35	0.30	37.8 ± 0.5	39.7 ± 1.5	36.0 ± 1.6	37.9
0.35 - 0.45	0.40	46.9 ± 1.0	48.0 ± 1.5	43.1 ± 1.6	46.0
0.45 - 0.60	0.52	57.1 ± 2.0	57.8 ± 1.8	54.2 ± 1.9	56.4
0.60 - 0.75	0.67	64.6 ± 3.3	65.0 ± 1.7	61.1 ± 1.9	63.5
0.75 - 1.00	0.87	72.2 ± 1.8	74.1 ± 1.6	69.4 ± 1.9	71.9
1.00 - 1.50	1.22	81.0 ± 4.2	82.6 ± 0.5	77.3 ± 2.6	80.3
1.50 - 2.00	1.73	87.8 ± 1.7	88.4 ± 1.3	85.2 ± 2.1	87.1
2.00 - 3.00	2.45	96.2 ± 2.0	96.5 ± 3.8	95.4 ± 1.9	96.0

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

Appendix 1

**EN779:2012 - Efficiency and pressure drop of untreated filter material at 50 % nominal velocity**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201511022  
 Test aerosol: DEHS  
 Discharging method: Isopropanol  
 Air flow rate: 7.3 l/s  
 Media velocity: 0.08 m/s  
 Size of material sample: 9.24 dm<sup>2</sup>

Particle size µm		Sample 1	Sample 2	Sample 3	Average
		Efficiency %			
Interval	Mean	Pressure drop			
		28 Pa	28 Pa	26 Pa	27 Pa
0.10 - 0.12	0.11	56.5 ± 8.0	48.1 ± 17.6	57.9 ± 7.3	54.1
0.12 - 0.15	0.13	47.9 ± 1.6	50.2 ± 2.9	43.6 ± 2.0	47.2
0.15 - 0.20	0.17	46.3 ± 1.4	45.6 ± 3.3	43.6 ± 1.9	45.2
0.20 - 0.25	0.22	46.7 ± 3.1	46.2 ± 2.5	42.8 ± 1.8	45.2
0.25 - 0.35	0.30	51.2 ± 1.8	51.1 ± 3.1	47.1 ± 2.3	49.8
0.35 - 0.45	0.40	61.2 ± 1.5	60.2 ± 2.1	58.0 ± 1.6	59.8
0.45 - 0.60	0.52	68.1 ± 0.9	67.2 ± 2.0	64.1 ± 1.5	66.5
0.60 - 0.75	0.67	74.1 ± 1.3	73.2 ± 2.5	70.9 ± 1.8	72.8
0.75 - 1.00	0.87	79.6 ± 1.3	79.9 ± 2.4	77.8 ± 1.2	79.1
1.00 - 1.50	1.22	86.4 ± 1.0	86.5 ± 2.4	85.1 ± 1.2	86.0
1.50 - 2.00	1.73	92.0 ± 1.8	92.3 ± 1.0	89.0 ± 2.0	91.1
2.00 - 3.00	2.45	96.3 ± 2.0	97.1 ± 1.2	95.1 ± 3.0	96.2

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

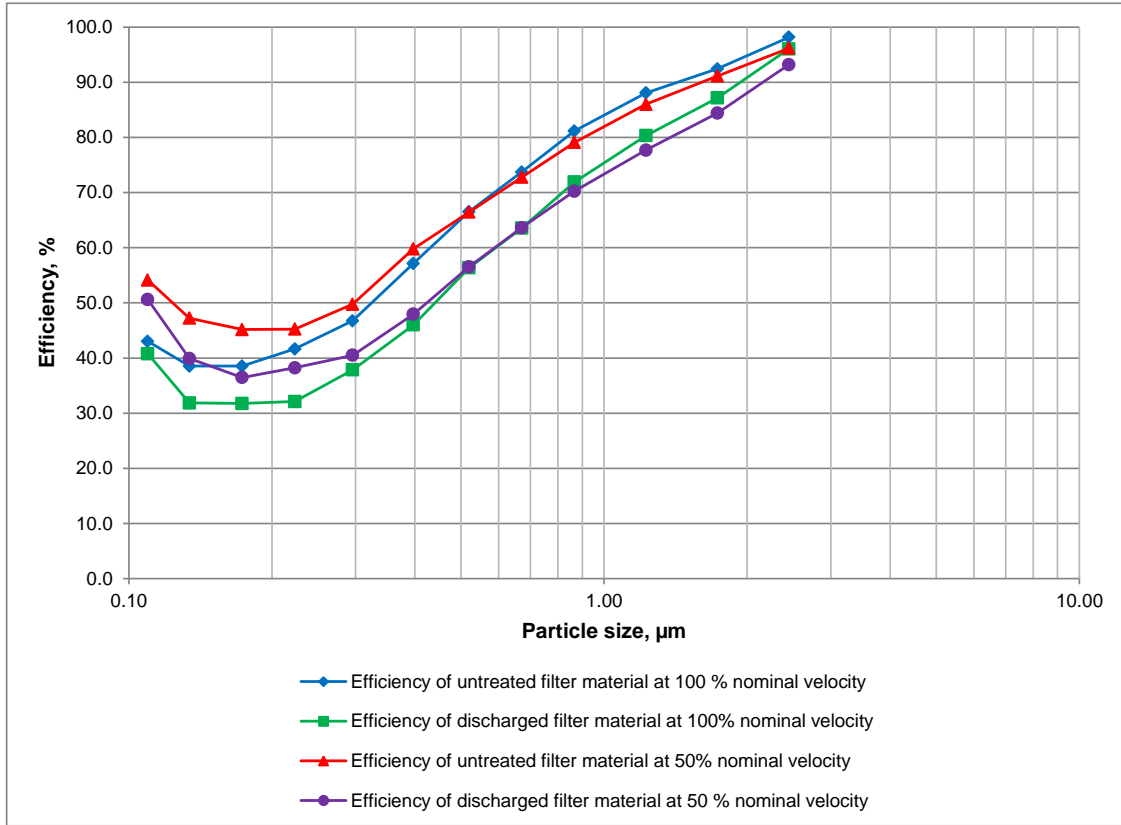
**EN779:2012 - Efficiency and pressure drop of discharged filter material at 50 % nominal velocity**

Air filter: Art No 700163M08, F7 592x592x635-8/25  
 Test no.: SP201511022  
 Test aerosol: DEHS  
 Discharging method: Isopropanol  
 Air flow rate: 7.3 l/s  
 Media velocity: 0.08 m/s  
 Size of material sample: 9.24 dm<sup>2</sup>

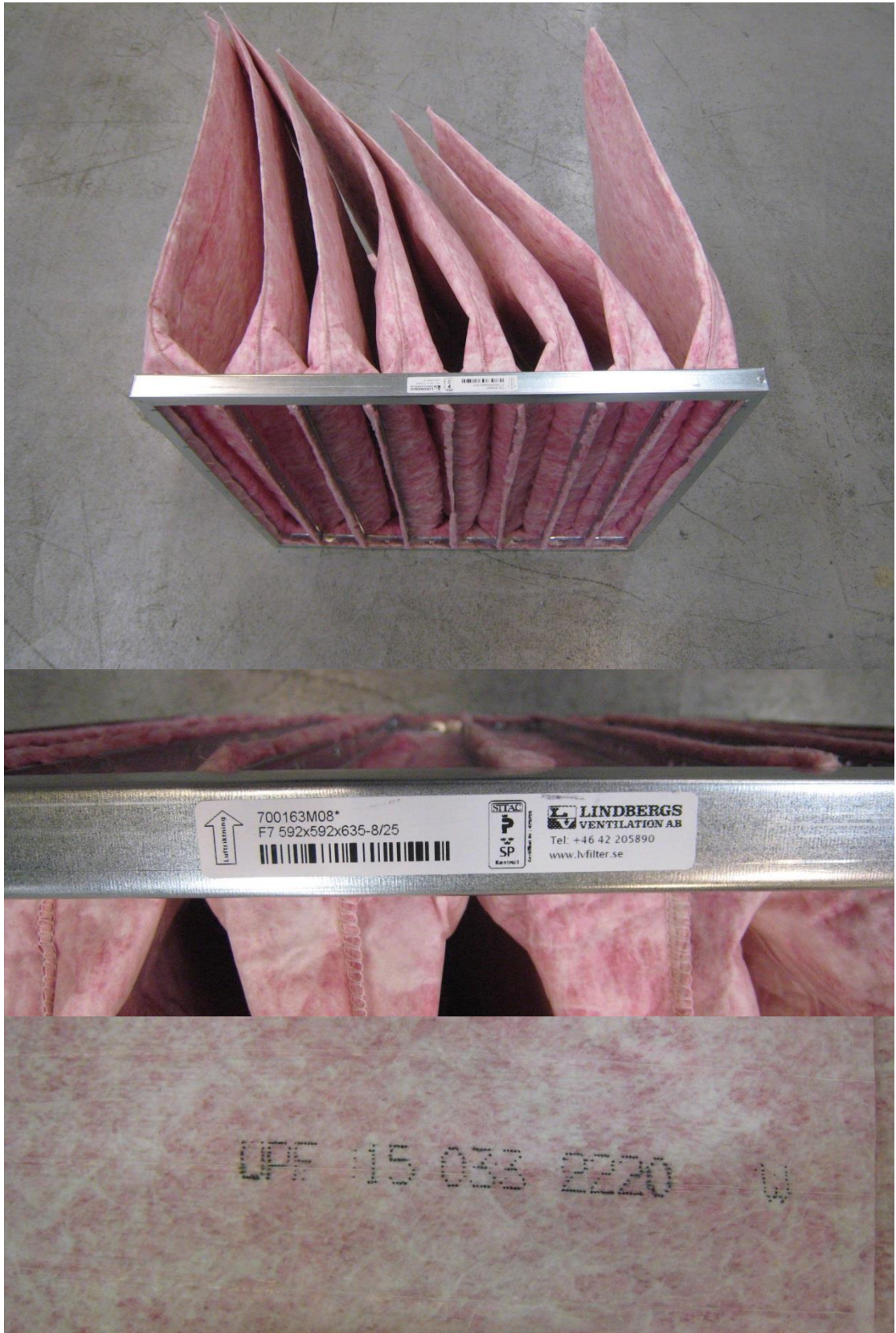
Particle size µm		Sample 1	Sample 2	Sample 3	Average
		Efficiency %			
Interval	Mean	Pressure drop			
		25 Pa	25 Pa	23 Pa	24 Pa
0.10 - 0.12	0.11	54.1 ± 2.5	50.7 ± 15.1	47.1 ± 13.5	50.6
0.12 - 0.15	0.13	41.0 ± 1.8	40.3 ± 3.9	38.4 ± 1.4	39.9
0.15 - 0.20	0.17	36.8 ± 3.1	37.8 ± 2.5	34.8 ± 2.0	36.5
0.20 - 0.25	0.22	39.5 ± 4.1	39.1 ± 3.6	36.0 ± 2.2	38.2
0.25 - 0.35	0.30	40.9 ± 3.5	41.3 ± 2.7	39.2 ± 1.5	40.5
0.35 - 0.45	0.40	49.3 ± 0.9	49.6 ± 3.1	44.8 ± 1.2	47.9
0.45 - 0.60	0.52	58.0 ± 2.6	57.1 ± 1.9	54.5 ± 1.6	56.5
0.60 - 0.75	0.67	65.6 ± 1.6	65.6 ± 1.6	59.7 ± 3.3	63.6
0.75 - 1.00	0.87	70.8 ± 2.1	71.7 ± 1.5	68.1 ± 1.2	70.2
1.00 - 1.50	1.22	80.0 ± 2.8	77.0 ± 2.3	76.1 ± 2.4	77.7
1.50 - 2.00	1.73	85.0 ± 2.1	84.6 ± 2.9	83.5 ± 2.5	84.4
2.00 - 3.00	2.45	93.4 ± 3.5	94.0 ± 3.0	92.2 ± 2.9	93.2

NOTE The uncertainty of the measured efficiencies is reported on a 95 % confidence level.

Appendix 1



Appendix 2



## Appendix 3

**The interpretation of test reports – according to EN779:2012 13.2 Interpretation of test reports**

This brief review of the test procedures, including those for addressing the testing of electrostatically charged filters, is provided for those unfamiliar with EN 779 procedures. It is intended to assist in understanding and interpreting the results in the test report/summary. (For further details of procedures the full EN 779 document should be consulted).

Many types of air filter rely on the effects of passive static electric charges on the fibers to achieve high efficiencies, particularly in the initial stages of their working life. Environmental factors encountered in service may affect the action of these electric charges so that the initial efficiency may drop substantially after an initial period of service. In many cases this is offset or countered by an increase in efficiency (“mechanical efficiency”) as dust deposits in filter media. In the later stages of operating life the efficiency may increase to equal or exceed the initial efficiency. The reported untreated and conditioned (discharged) efficiencies show the extent of the electrical charge effect on initial performance. It should not be assumed that the measured conditioned (discharged) efficiency represents real life behaviour. It merely indicates the level of efficiency obtainable with the charge effect completely removed and with no compensating increase in mechanical efficiency.

For reasons of consistency filter efficiencies are measured using artificially generated clouds of synthetic DEHS material (droplets) with closely controlled particle size. These efficiency measurements are repeated after the filter has been loaded with ASHRAE loading dust until the resistance has risen to a value of 250 Pa in the case of the coarse (G) procedure and with up to a value of 450 Pa for the fine and medium (F and M) procedure. Test dust capacities measured in this way may be used for to compare performances and for rankings but should not be assumed to simulate real life operating conditions as the properties of dusts encountered in service conditions vary very widely.

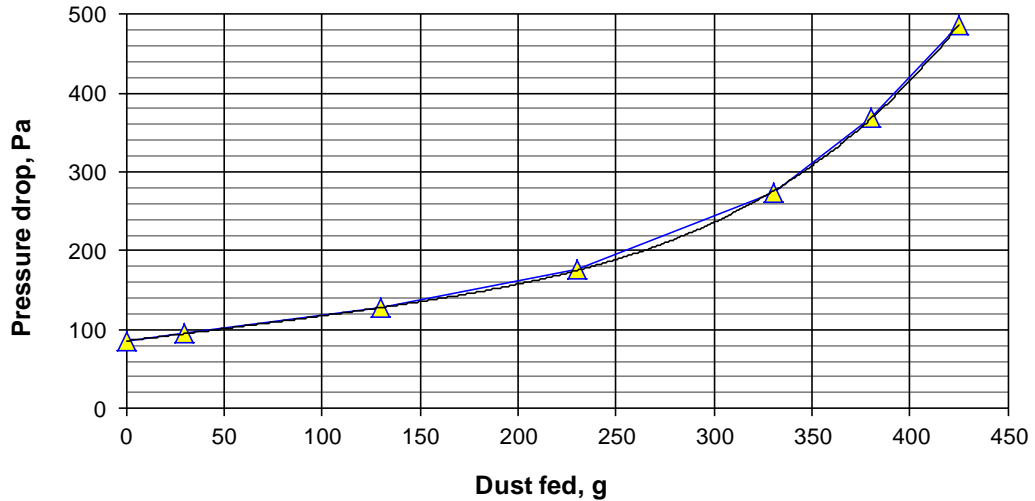
Appendix 4

**EUROVENT 4/21 - 2014**

**Calculation method for the energy use related to air filters in general ventilation systems**

<b>Air filter:</b>	Art No 700163M08, F7 592x592x635-8/25
<b>Group of filter:</b>	F7

$$y = 1.36697E-08x^4 - 3.22491E-06x^3 + 4.30498E-04x^2 + 2.92707E-01x + 8.59115E+01$$



$\Delta p_i$	86	Pa
<b>a</b>	1.37E-08	Pa/g <sup>4</sup>
<b>b</b>	-3.22E-06	Pa/g <sup>3</sup>
<b>c</b>	4.30E-04	Pa/g <sup>2</sup>
<b>d</b>	2.93E-01	Pa/g
<b>M<sub>x</sub></b>	100	g

<b>Average <math>\Delta P</math></b>	101.3	Pa
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<b>Energy, W</b>	1148.3	kWh
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