

# TECH TIPS

*Sales and Marketing Information on Airguard Air Filtration Products*

## ASHRAE Standard 52.2 Explained

# ASHRAE Efficiency Ratings Provide New Method Of Measuring Filter Performance

The new ASHRAE Standard 52.2 provides the first industry accepted procedure for measuring filter efficiency by particle size.

The need for a more precise measurement of a filter's ability to remove specific particle sizes has become more critical as concern over indoor air quality, respirable particles, as well as protection of products and processes, has continued to grow.

### Standard 52.2 Supplements Standard 52.1

Standard 52.2 is not intended to be a replacement for standard 52.1. Both will continue to be relied upon as the industry accepted measures of filter performance. The arrestance and dust holding capacity data provided by Standard 52.1 will remain as valuable performance characteristics. However, it is anticipated that as the fractional efficiency test (52.2) becomes more widely understood and accepted, the atmospheric dust spot efficiency test (52.1) will no longer be utilized.

### Particle Size Ranges

The 52.2 procedure calls for efficiency measurements to be taken on twelve (12) particle size ranges. (See example to right.)

For reporting and rating purposes, these twelve (12) ranges are grouped into three (3) wider ranges:

E<sub>1</sub> - 0.3 - 1.0 Microns

E<sub>2</sub> - 1.0 - 3.0 Microns

E<sub>3</sub> - 3.0 - 10.0 Microns

### Standard 52.2 Test Procedure

Efficiency measurements are taken on each of the twelve (12) particle size ranges at six (6) different points during the test:

Clean (after (4) increments of dust loading).

After the final resistance has been reached.

Standard synthetic ASHRAE dust, comprised of 72% SAE standard J726 test dust (fine), 23% powdered carbon, and 5% milled cotton linters is used to load the filter in five (5) equal increments.

The six (6) efficiency measurements for each of the twelve (12) particle size ranges (72 total efficiency measurements) are taken by challenging the filter with potassium chloride (KCl) particles. This test aerosol provides particles over the entire range of 0.3 to 10.0 microns required by the test procedure.

The lowest efficiency value (of the six (6) measurements taken throughout the test) for each of the twelve (12) particle size ranges is recorded. (Note: The six (6) readings for each particle size range are not averaged. The lowest efficiency value is used.)

The twelve (12) readings are grouped into the three (3) wider ranges (E<sub>1</sub>, E<sub>2</sub>, E<sub>3</sub>).

These values are then averaged to provide an average Particle Size Efficiency (PSE) for each range. The PSE values are used to classify the filter into one of the sixteen (16) Minimum Efficiency Reporting Value (MERV) Ratings.

### Standard Test Air Flow Rates

Standard 52.2 prescribes that the tests are to be run at one of seven (7) air flow rates:

118 FPM (.60 m/s)

246 FPM (1.25 m/s)

295 FPM (1.50 m/s)

374 FPM (1.90 m/s)

492 FPM (2.50 m/s)

630 FPM (3.20 m/s)

748 FPM (3.80 m/s)

### Example: MERV-14 Rating (see back for MERV Rating Schedule.)

Particle Size Range (Microns)	Lowest Efficiency (%) (based on 6 readings over life of test)	Average Particle Size Efficiency (PSE)
.30 - .40	74%	84% (E <sub>1</sub> )
.40 - .55	82%	
.55 - .70	87%	
.70 - 1.0	92%	
1.0 - 1.3	96%	98% (E <sub>2</sub> )
1.3 - 1.6	98%	
1.6 - 2.2	99%	
2.2 - 3.0	100%	
3.0 - 4.0	100%	100% (E <sub>3</sub> )
4.0 - 5.5	100%	
5.5 - 7.0	100%	
7.0 - 10.0	100%	

To determine the MERV Rating, start with the PSE value for E<sub>1</sub>, then E<sub>2</sub>, then E<sub>3</sub> to arrive at the proper rating:

E<sub>1</sub> is 84%; Therefore the maximum rating would be MERV-14.

E<sub>2</sub> and E<sub>3</sub> both exceed 90%; therefore the filter receives an MERV-14 Rating.



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### Minimum Efficiency Reporting Values (MERV) ASHRAE Standard 52.2

Group Number	MERV Rating	E <sub>1</sub> Average Particle Size Efficiency (PSE) 0.3 - 1.0 Microns	E <sub>2</sub> Average Particle Size Efficiency (PSE) 1.0 - 3.0 Microns	E <sub>3</sub> Average Particle Size Efficiency (PSE) 3.0 - 10.0 Microns	Average Arrestance (ASHRAE 52.1)	Minimum Final Resistance (In. W.G.)
1	MERV 1	-	-	Less than 20%	Less than 65%	0.3"
	MERV 2	-	-	Less than 20%	65 - 69.9%	0.3"
	MERV 3	-	-	Less than 20%	70 - 74.9%	0.3"
	MERV 4	-	-	Less than 20%	75% or greater	0.3"
2	MERV 5	-	-	20 - 34.9%	-	0.6"
	MERV 6	-	-	35 - 49.9%	-	0.6"
	MERV 7	-	-	50 - 69.9%	-	0.6"
	MERV 8	-	-	70 - 84.9%	-	0.6"
3	MERV 9	-	Less than 50%	85% or greater	-	1.0"
	MERV 10	-	50% - 64.9%	85% or greater	-	1.0"
	MERV 11	-	65% - 79.9%	85% or greater	-	1.0"
	MERV 12	-	80% - 89.9%	90% or greater	-	1.0"
4	MERV 13	Less than 75%	90% or greater	90% or greater	-	1.4"
	MERV 14	75% - 84.9%	90% or greater	90% or greater	-	1.4"
	MERV 15	85% - 94.9%	90% or greater	90% or greater	-	1.4"
	MERV 16	95% or Greater	95% or greater	95% or greater	-	1.4"

#### Notes:

1. ASHRAE Standard 52.2 tests are to be conducted at one of seven (7) air flow rates:

118 FPM (.60 m/s)	492 FPM (2.50 m/s)
246 FPM (1.25 m/s)	630 FPM (3.20 m/s)
295 FPM (1.50 m/s)	748 FPM (3.80 m/s)
374 FPM (1.90 m/s)	

2. The air flow rate at which the filter was tested is included in the MERV rating (MERV-10 @2.5 m/s).

3. Filters with an E<sub>3</sub> efficiency of less than 20% (MERV-1 through MERV-4) must also be tested for arrestance per ASHRAE Standard 52.1.

4. Final resistance must be at least twice the initial resistance at the test air flow rate, or the values shown in the table above, whichever is greater.

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CLARCOR Air Filtration Products

P.O. Box 32578 • Louisville, KY 40232

Customer Service Team: 1-866-247-4827 • Fax: 1-800-784-3458

Email: mailbag@airguard.com • www.airguard.com

[www.airguard.com](http://www.airguard.com)



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