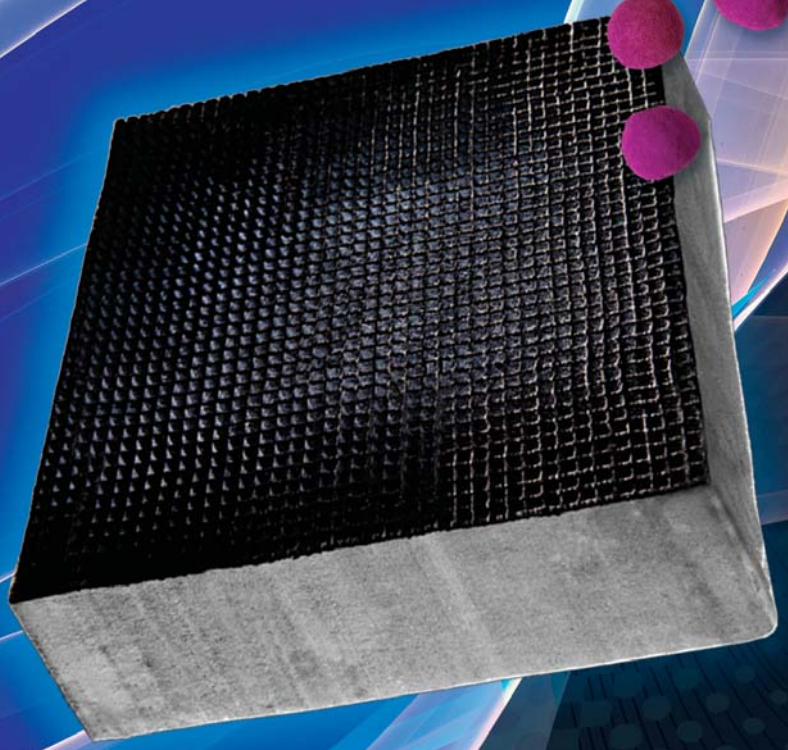
GRIDBLOK™

NEXT EVOLUTION IN MEDIA



REVOLUTIONARY FILTRATION PERFORMANCE

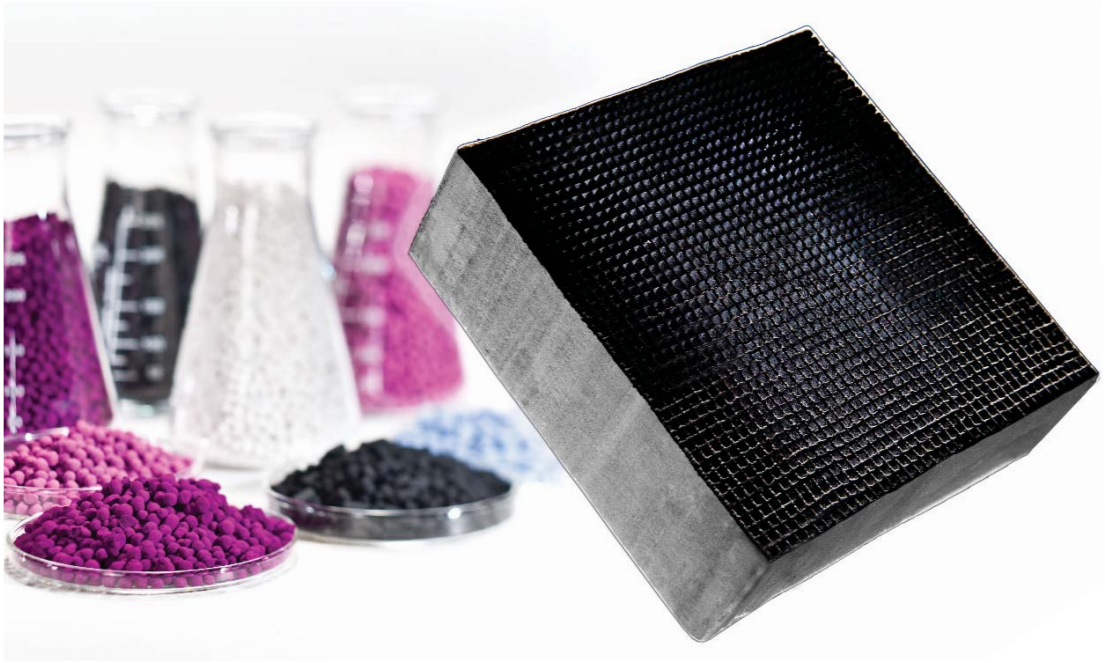
PURAGRID™

METRIC
MILLIMETERS
CENTIMETERS
0 1 2 3 4 5 6 7 8 9 10 11 12

PURAFIL®

FIRST IN CLEAN AIR

ENGINEERED 4 ADVANCED CHEMICAL AIR FILTRATION



1	2	3
Nb	lPd	Df
NO BYPASS	LOW PRES-SURE DROP	DUST FREE

For over 40 years, Purafil has been the world leader in the designing, engineering, and manufacturing gas-phase air filtration media, filters, systems and air monitoring instrumentation. Historically, the premise of gas-phase filtration revolved around various sized and shaped pellets. Purafil, the industry leader, created a revolutionary delivery system – the GridBLOK™ technology. The Purafil GridBLOK™ delivery system is the foundation for the next generation of gas-phase air filtration products.

The GridBLOK™ is a new gas-phase air filtration medium in the form of an extruded monolithic block consisting of a large number of small straight and parallel cells or channels. The GridBLOK™ is composed of essentially 100% adsorbent materials allowing the entire composite structure to function as a gas filter.

Due to the large number of cells in each GridBLOK™, the contact area between the adsorbent layer and the airstream that travels inside the cells is very large. Furthermore, the cells are straight and parallel so that the flow is not obstructed and the pressure drop across the GridBLOK™ is extremely low.

The cellular geometry of the extruded GridBLOK™ provides a high surface area per unit volume important for proper impregnation of adsorptive materials. The size of the cells leads to turbulent flow and forces contaminated air into and through the gas-permeable cell walls of the GridBLOK™. It also provides the residence time necessary to assure optimum contact efficiency and the associated high initial and average removal efficiencies. As the air is forced through the GridBLOK™, removal of chemical contaminants takes place.

A primary role of Purafil's R&D program is to continually develop new delivery systems for our dry-scrubbing air filtration media and products. The Purafil patent protected GridBLOK™ delivery system is the foundation for the next generation of gas-phase air filtration products. The innovative GridBLOK™ delivery system will successfully integrate into Purafil's Family of Products.

Features and Benefits:

- No bypass – all of the air goes through the filter
- Low pressure drop – provides for energy savings
- Turbulent flow – cell geometry provides high contact efficiency with contaminant gases
- Composite structure – fully available for adsorption with impregnations for specific gases
- Full utilization of the media – removal efficiences and capacties comparable to granular media
- Dust free – eliminates the requirement for a final filter
- Self supporting – provides structural stability

GridBLOK™ OVERVIEW

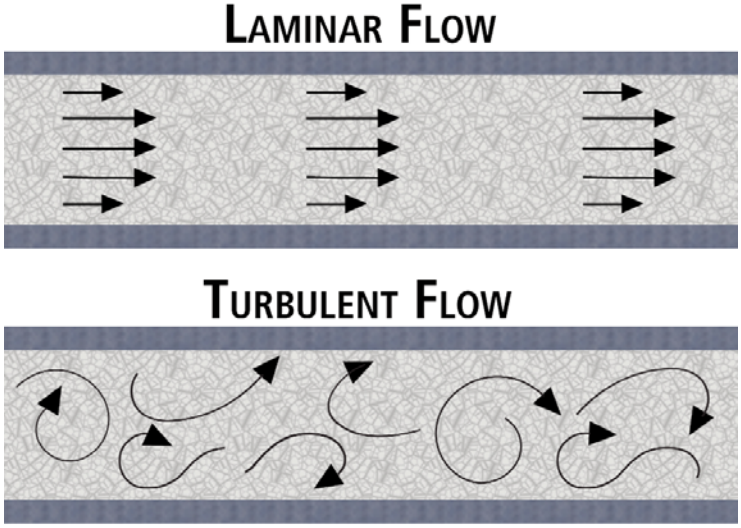
The size and shape of the cells in the GridBLOK™ lead to turbulent flow assuring a constant velocity profile in all internal parts of the cells. The exception is the thin layer of gas at the cell wall, in which the flow velocity sharply increases from an almost zero value. As the gas velocity increases, it is in this region where the flow begins to change to turbulent flow. It is this turbulent flow that ensures the GridBLOK™'s superior performance.

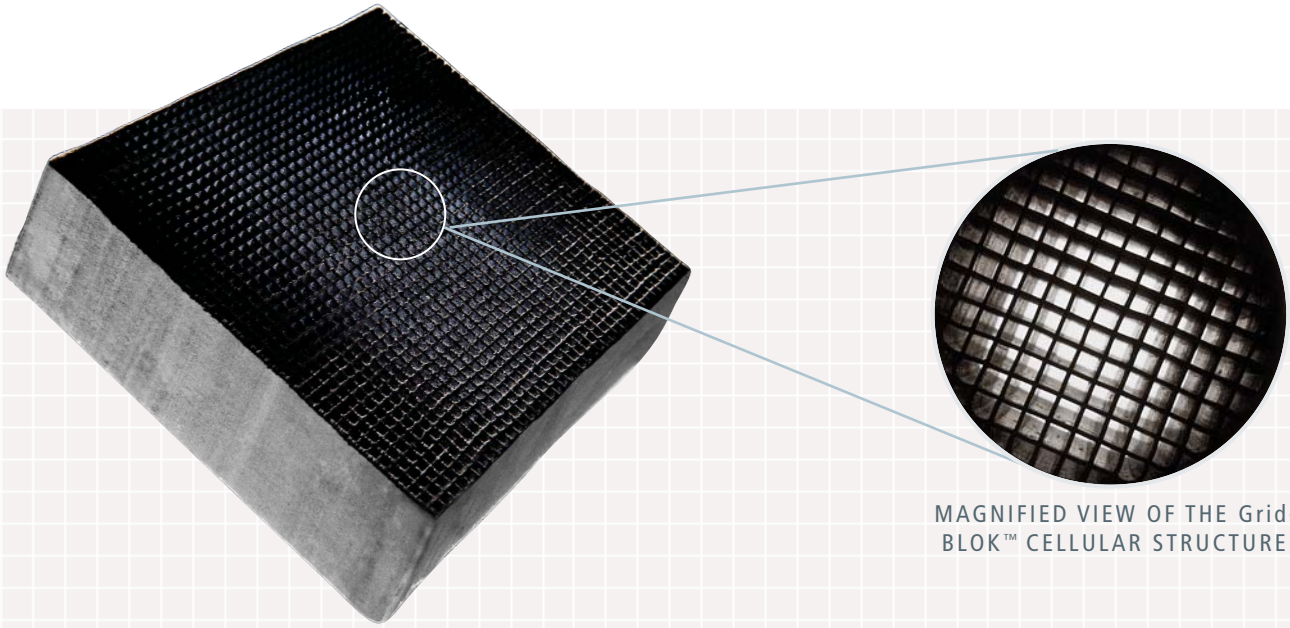
TURBULENT FLOW

The flow of air through a self-supporting grid structure can be either laminar or turbulent (Figure 1). Laminar flow of gases can only be maintained up to a critical mean velocity, because at higher velocities turbulent flow begins. Monolithic structures have straight flow paths with very small cell dimensions and, in many instances, the flow through the channels is laminar, which offers advantages such as low pressure drop. However, laminar flow also means that there is very little mixing of the airstream during the flow through the grid structure. As a result, the contact efficiency between the grid's surface and the contaminant(s) to be removed may be very low with a corresponding low removal efficiency.

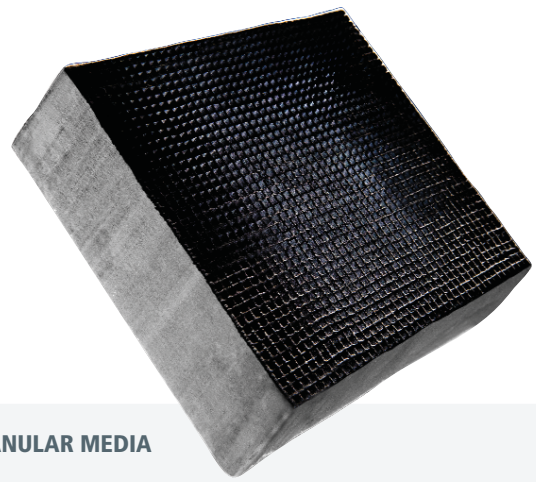
The turbulent flow of gases is the most widespread and also the most complex form of fluid movement through a monolithic structure. The flow of gases and air through the GridBLOK™ delivery system is distributed in such a way that there is great friction between the wall and the flowing gases. This enhances gas filtration performance due to the turbulence causing extensive and continual mixing across the airstream. More of the gas molecules contact the walls of the channels and more efficient gas removal is the result.

Figure 1





MAGNIFIED VIEW OF THE GridBLOK™ CELLULAR STRUCTURE



GridBLOK VERSUS GRANULAR MEDIA

Various gas-phase air filter designs using granular adsorbents in commercial applications strive to make the large internal surface area (porosity) of the media accessible to a moving airstream, or more accurately to the undesireable gaseous contaminants in the airstream, so they may be removed. The better the efficiency of the design in doing so, the better the adsorbent will be utilized.

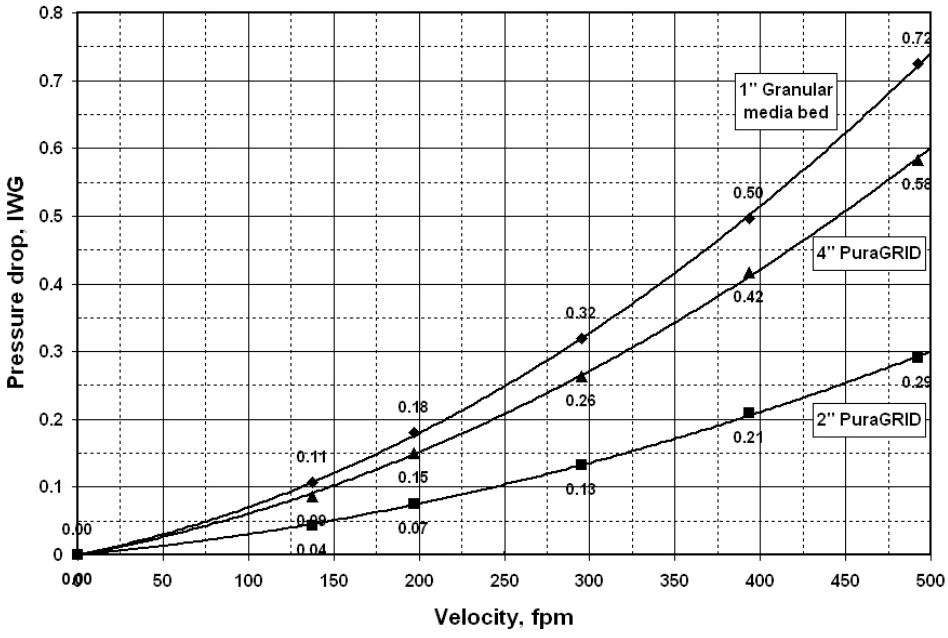
In packed beds of granular media all of the surface area may not be accessible due to airflow patterns that develop because of non-uniform sized particles, settling of the media bed, etc. Also, the adsorbent particles have to be of a sufficiently large diameter to provide a manageable pressure drop which can also prevent full utilization of the adsorbent. When these same adsorbent materials are made available in the GridBLOK structure, the adsorption capacity can be better utilized and a more efficient filter design is the result. Further, the velocity profile through the GridBLOK is almost constant in all parts of the cell which provides for a pressure drop significantly lower than a 1" bed of granular media (Figure 2).

Of the parameters that Purafil can control during the GridBLOK™ manufacturing processes, cell dimension, wall thickness, and cell shape have been optimized for high gas filtration performance. Due to this manufacturing flexibility and the ability to independently manipulate these geometric parameters, the opportunity also exists to further optimize the design for more specific applications. Design flexibility is much more limited with granular materials due to the requirement for a separate delivery system (e.g., trays, modules) and having to balance pressure drop versus particle size.

It is desirable to obtain high gas removal efficiencies from small bed volumes. In the GridBLOK™, the structure of the cell walls optimize the open area for air flow thereby increasing residence time, while increasing the contact efficiency between the contaminant(s) to be removed and cell walls. Due to the high rate of contaminant diffusion to the interior of the cell wall and empty sites being continuously available for adsorption, the GridBLOK™ provides better adsorption efficiencies and capacities than prior attempts with monolithic structures.

Adsorption efficiency will depend on how efficiently the molecules come in contact with the cell walls, which is determined by wall thickness, gas flow rate and concentration as well as by the size of the pores relative to the contaminant molecules. Initially, all the available adsorption sites are vacant and so all the gas molecules are being adsorbed. At the same time, these molecules begin to diffuse inside the cell wall. As more surface sites become available due to diffusion to the interior, more adsorption can take place. The walls of the GridBLOK™ structure allow rapid diffusion of gases through the walls to take advantage of the large internal surface area and provide the maximum removal capacity possible.

Figure 2

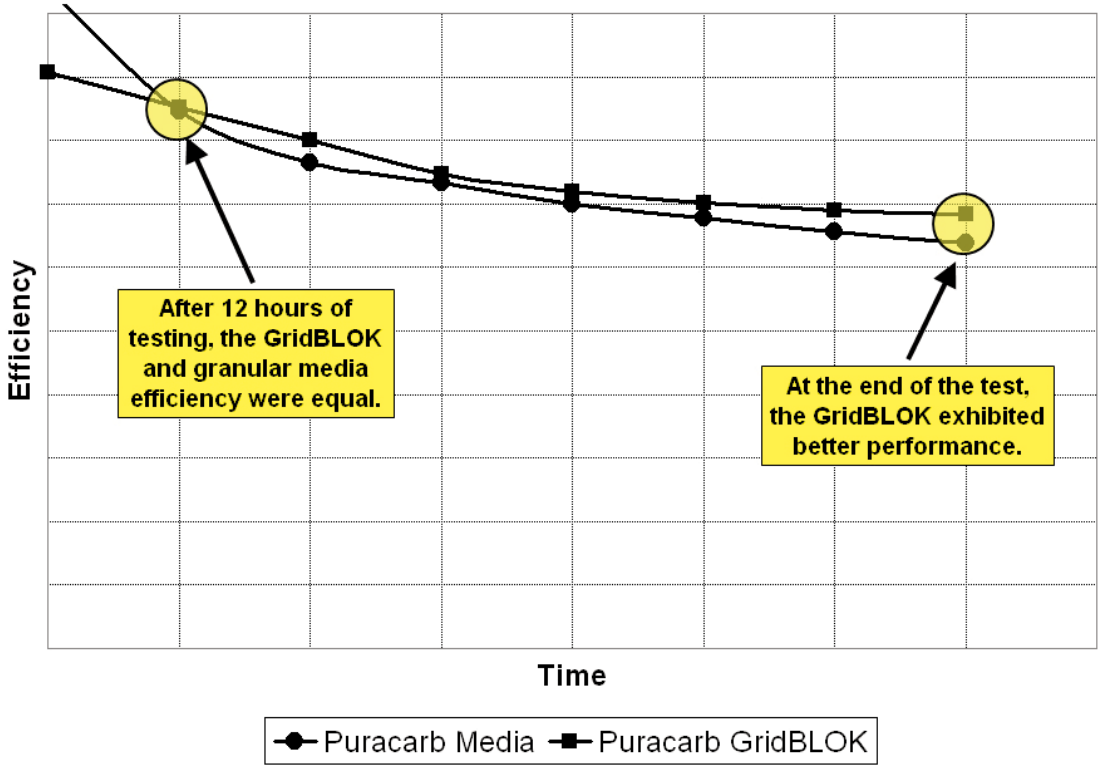


INDEPENDENT TESTING

In spite of the open structure of the GridBLOK™, it has been proven to exhibit breakthrough curves similar to packed beds. This behavior can be explained in terms of dynamic equilibrium between adsorption and diffusion of the adsorbate molecules into the cell walls.

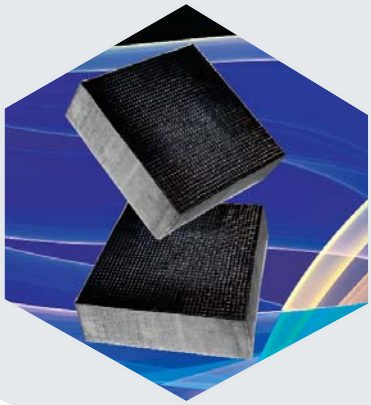
The GridBLOK™ was submitted to an internationally recognized independent research institute to evaluate its performance relative to traditional 1" packed beds of granular dry-scrubbing media and experimental data have been obtained using dynamic flow apparatus (Figure 3).

Figure 3



AIR SCRUBBING:

There are currently four types of GridBLOK™ available: The Purakol® GridBLOK™, the Puracarb® GridBLOK™, Puracarb® AM GridBLOK™, and the Chlorosorb® GridBLOK™. Just as their granular namesakes, they are effective against a number of gaseous contaminants and can be combined to provide the best performance in a wide range of applications. The performance of the GridBLOK™'s monolithic structure-based system is comparable to, and in some cases superior to, traditional packed-bed media systems. Combine these media choices with low pressure drop, and performance characteristics and you now have a superior option for controlling gaseous contamination.

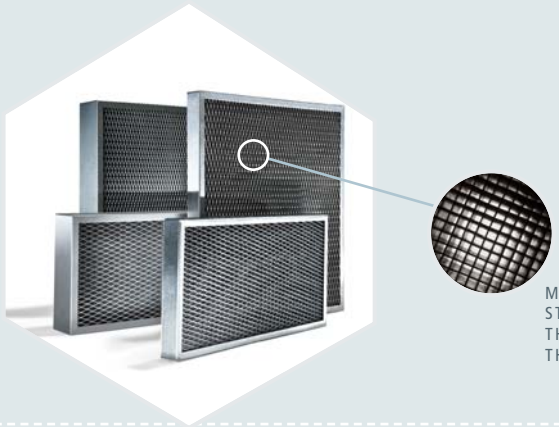


The GridBLOK is available in the following MEDIA compositions:

1. **PURAKOL® -** Used in combination with other Purafil media to ensure broad-spectrum removal of pollutants.
2. **PURACARB® -** Manufactured specifically for corrosive environments and removal of acid gases, including hydrogen sulfide and sulfur dioxide, in industrial settings.
3. **PURACARB® AM -** Used specifically for the control of ammonia and amines.
4. **CHLOROSORB® -** Manufactured with enhanced capacity for removal of chlorine.

PURAGRID™

The PuraGRID™ is a revolutionary new filter that is designed to supply a large amount of chemical filtration with minimal amount of pressure drop. Our newly developed media delivery system offers increased operational performance and energy savings. The new PuraGRID™ bridges the gap between Purafil's existing line of filtration products, enabling a clean air solution for every application and market.



MAGNIFIED CELLULAR STRUCTURE VIEW OF THE GridBLOK™ INSIDE THE PuraGRID™ FILTER

PuraGRID™ Filters (IP units)

Filter Type	Filter Size, in.			Exact Size, in.			GridBLOK Density	Media Amount per Filter		Frame Material	Airflow		Pressure Drop
	w	h	d	w	h	d	lb/ft³	in³	lb		fpm	cfm	i.w.g.
PuraGRID 2"	24	24	2	23 3/8	23 3/8	1 3/4	27.54	533	8.5	Galvanized	500	2000	0.29
PuraGRID 2"	20	25	2	19 1/2	24 1/2	1 3/4	27.54	444	7.1	Galvanized	500	1736	0.29
PuraGRID 2"	20	20	2	19 1/2	19 1/2	1 3/4	27.54	370	5.9	Galvanized	500	1389	0.29
PuraGRID 2"	16	20	2	15 1/2	19 1/2	1 3/4	27.54	296	4.7	Galvanized	500	1111	0.29
PuraGRID 2"	12	24	2	11 3/8	23 3/8	1 3/4	27.54	266	4.2	Galvanized	500	1000	0.29
PuraGRID 4"	24	24	4	23 3/8	23 3/8	3 3/4	27.54	1353	21.6	Galvanized	500	2000	0.58
PuraGRID 4"	20	25	4	19 1/2	24 1/2	3 3/4	27.54	1127	18.0	Galvanized	500	1736	0.58
PuraGRID 4"	20	20	4	19 1/2	19 1/2	3 3/4	27.54	940	15.0	Galvanized	500	1389	0.58
PuraGRID 4"	16	20	4	15 1/2	19 1/2	3 3/4	27.54	752	12.0	Galvanized	500	1111	0.58
PuraGRID 4"	12	24	4	11 3/8	23 3/8	3 3/4	27.54	676	10.8	Galvanized	500	1000	0.58

PuraGRID™ Filters (metric units)

Filter Type	Filter Size, in.			Exact Size, mm			GridBLOK Density	Media Amount per Filter		Frame Material	Airflow		Pressure Drop
	w	h	d	w	h	d	g/cc	cm³	kg		m/s	m³/h	Pa
PuraGRID 2"	610	610	51	594	594	44	0.4411	8730	3.9	Galvanized	2.5	3398	73
PuraGRID 2"	508	635	51	495	622	44	0.4411	7275	3.2	Galvanized	2.5	2950	73
PuraGRID 2"	508	508	51	495	495	44	0.4411	6063	2.7	Galvanized	2.5	2360	73
PuraGRID 2"	406	508	51	394	495	44	0.4411	4850	2.1	Galvanized	2.5	1888	73
PuraGRID 2"	305	610	51	289	594	44	0.4411	4365	1.9	Galvanized	2.5	1699	73
PuraGRID 4"	610	610	102	594	594	95	0.4411	22170	9.8	Galvanized	2.5	3398	146
PuraGRID 4"	508	635	102	495	622	95	0.4411	18475	8.2	Galvanized	2.5	2950	146
PuraGRID 4"	508	508	102	495	495	95	0.4411	15396	6.8	Galvanized	2.5	2360	146
PuraGRID 4"	406	508	102	394	495	95	0.4411	12317	5.4	Galvanized	2.5	1888	146
PuraGRID 4"	305	610	102	289	594	95	0.4411	11085	4.9	Galvanized	2.5	1699	146

PURAFIL

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