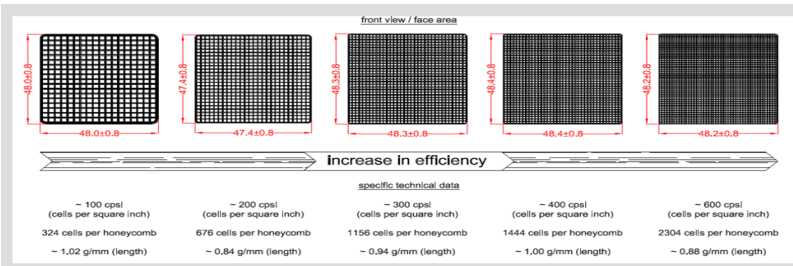


PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Dräger's Viper Filter Technology, based on Extruded Monoliths, allows the Offering of a New Generation of Respiratory Protection Technology with Virtually Zero Breathing Resistance, yet Potentially Still Providing the Required Filtering Performance Against the Threats a Modern Warfighter Could Encounter

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VIPER aims to shift the paradigm from designing around the current filter technology restrictions to designing around a structure that allows for almost natural respiration. The filter form factor in VIPER is an active variable in the overall system design, not a pre-designated limitation.



Key Advantages

- Endless filter shapes
 - Replace cylinders with more efficient shapes
 - Reduced footprint for same level of protection
- Protection levels customizable and scalable
 - Pre-filters / filter extensions possible with improved filter shapes
- New possibilities for filter positioning – filter off the face
 - Re-shape filter for mounting elsewhere on Operator to further reducing facial profile
 - Decrease user profile in key workspace
 - Create space for comms integration
 - Increase operator visual accessory compatibility
- BACKWARDS compatible (Rd-40)
 - Immediately benefits to reduce user burden with in-service respirators during development cycle as per original industrial concept
- PAPR Option
 - Significantly less energy required to draw air
 - Extended run times or reduced battery requirements
 - Smaller and lighter PAPR units possible
- Scalable form factor
 - Potential to be utilized in bundles/stacks/arrays in vehicles / facilities
 - Reduced supply-chain burden with common components
 - Plug-and-play to existing systems (RD-40 designs possible)

The monolith VIPER design allows for deliberate structural layout with dynamic media properties Geometry, cellularity, ratio of binder / activated carbon, choice of raw activated carbon, chemical impregnation, and the general manufacturing process can all be tailored to specific requirements. To date, VIPER has been manufactured and approved to the Industrial ABEK2 Standard (EN 14387), whilst maintaining the significant reduction in breathing resistance.

Gas filter capacity (EN 14387)*

Test gas	Standard Min	Test result
Cyclohexane (C6H12)	35 min	> 50 min
Chlorine (Cl2)	20 min	> 35 min
Hydrogen sulfide (H2S)	40 min	> 100 min
Hydrogene cyanide (HCN)	25 min	> 27 min
Sulfur dioxide (SO2)	20 min	> 22 min
Ammonia (NH3)	40 min	> 43 min

Weight, separation efficiency and breathing resistance were determined for each sample and listed in the table below (sample code is on each filter sample). The separation efficiency was determined according to DIN EN 143:2007-02 using paraffin oil (efficiency > 99.95 %, penetration < 0.05 %).

Sample code	Weight	penetration*	Breathing resistance @ 30 L·min ⁻¹ #	Breathing resistance @ 95 L·min ⁻¹ #	Breathing resistance @ 180 L·min ⁻¹
Sample 01/10	416.3 g	0.0011 %	0.51 mbar	1.83 mbar	4.10 mbar
Sample 02/10	416.2 g	0.0008 %	0.52 mbar	1.84 mbar	4.13 mbar
Sample 03/10	413.4 g	0.0007 %	0.51 mbar	1.86 mbar	4.12 mbar
Sample 04/10	414.8 g	0.0008 %	0.51 mbar	1.82 mbar	4.09 mbar
Sample 05/10	415.6 g	0.0009 %	0.51 mbar	1.87 mbar	4.10 mbar
Sample 06/10	418.2 g	0.0008 %	0.51 mbar	1.84 mbar	4.09 mbar
Sample 07/10	417.0 g	0.0009 %	0.51 mbar	1.85 mbar	4.11 mbar
Sample 08/10	414.5 g	0.0092 %	0.52 mbar	1.85 mbar	4.06 mbar
Sample 09/10	414.8 g	0.0008 %	0.52 mbar	1.88 mbar	4.16 mbar
Sample 10/10	413.1 g	0.0008 %	0.50 mbar	1.86 mbar	4.04 mbar

*efficiency for P-3 classification > 99.95 % and penetration for P-3 classification < 0.05 %

#DIN EN 14387:2008-05: maximum breathing resistance 2.6 mbar at 30 L·min⁻¹ and 9.8 mbar at 95 L·min⁻¹

As the battlefield evolves into more complex and intertwined domains, the Warfighter is being challenged with more demands on their physical and mental capacity. Therefore, it is now essential to provide a respiratory protection system that can alleviate some of these demands, allowing the Warfighter to be fully effective during the mission. Dräger is now actively engaged with an entity of the US DoD to advance the VIPER filter technology to the next level, to fulfil the required MIL-STD for a full CBRN variant, along with exploring various applications that the technology can assist with, to allow the Warfighter to fulfil their mission.