

Industrial Filtration Products



Graver Technologies

- Introduction
- Who we are?
 - Graver Technologies, Industrial Filtration
- Markets
 - Industrial | OEM | Air Purification
- Market Segments
- Applications
- Features and Benefits

Graver Technologies

Industrial Filtration



Honeoye Falls, NY

Industrial Air/Gas Filters and liquid housing
manufacturing

Our Values

Industrial Filtration



Trust

We trust our people to make the right decision for the business—every time—no matter how difficult the decision may be. Trust and ethics together form Marmon's cornerstone.



Ethics

Marmon and Berkshire Hathaway insist on high integrity from everyone in the organization. As with trust, ethical conduct is non-negotiable. There can be no exceptions.



People

People make the difference! Marmon's highly decentralized organization relies heavily on individuals with the aptitude and attitude to drive our success, and we are committed to attracting and retaining the best talent.



Entrepreneurship

Our managers are given great freedom and responsibility to run a Marmon business as if it were their own. This high level of autonomy and accountability requires leaders who possess not only exemplary skills but also exemplary character.



Innovation

To succeed, we must invest wisely in our best opportunities. Where we have a strong competitive position in a growing market and meet a crucial need for the customer, we earn the right to win.

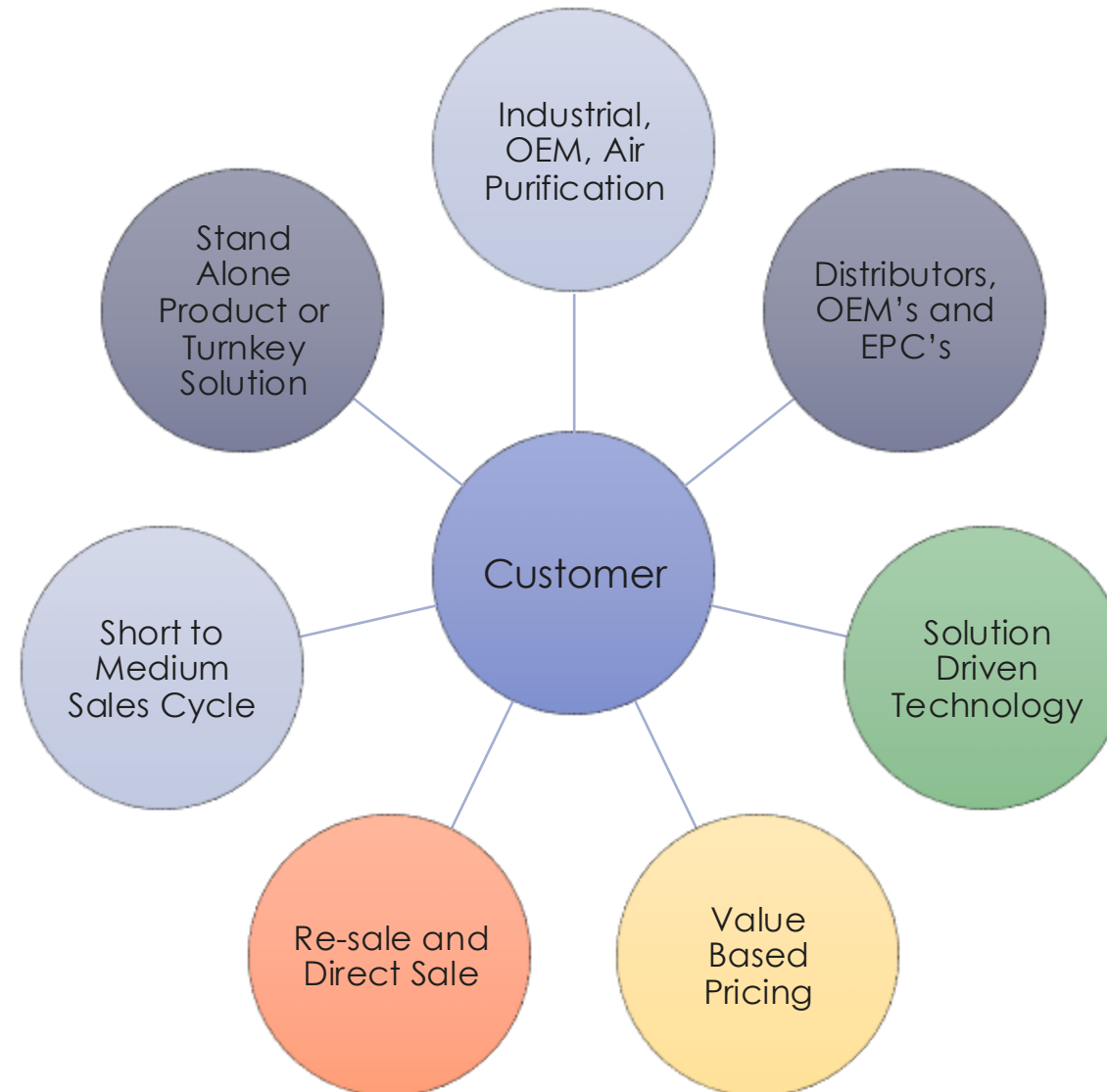


Fun

Everyone in our organization is expected to work hard and deliver results. At the same time, we want everyone to enjoy what they do and find personal fulfillment in their work.

Go To Market Strategy

Industrial Filtration



Product Portfolio

Industrial Filtration

Filter Housing Styles

- Liquid High-flow
- Filter/Separator
- Particulate filter
- Liquid/Liquid Coalescer
- Liquid Multi-Cartridge
- Vacuum Exhaust



Custom Designed Solutions

- Skid mounted
- Heat trace and insulation
- Instrumentation
- Process Controls



Product Portfolio

Industrial Filtration

Filter Housing Styles

- Sewn Ends
- Molded Ends
- Metal Ends
- Panel Filters
- HEPA Filters
- Custom OEM



Media Types

- Polyester
- Fiberglass
- Polypropylene
- Nomex
- Teflon
- Ceramic
- Cellulose
- HEPA & ULPA Grades
- PLEKX active carbon media

Housing Design Capabilities

Industrial Filtration

- Graver Technologies designs filtration solutions to customer specifications.
 - Gas Flow Rates to 250,000 SCFM/40,000 Nm³/h
 - Liquid Flow Rates to 6,000 GPM/1,300 m³/h
 - Pressure Ratings to 6,000 PSIG/400 barg
 - Carbon and Stainless Steel
 - NEMA and ATEX Electrical
 - ISO 9001-2015 Certified and Registered
 - ASME Code Section VIII, Div. 1 Certified and Registered
 - PED 2014/68/EU
 - CRN registration
- OEM manufacturers count on Graver Technologies to meet their stringent process requirements for coalescing and particulate filtration.



High Flow Housings

Industrial Filtration

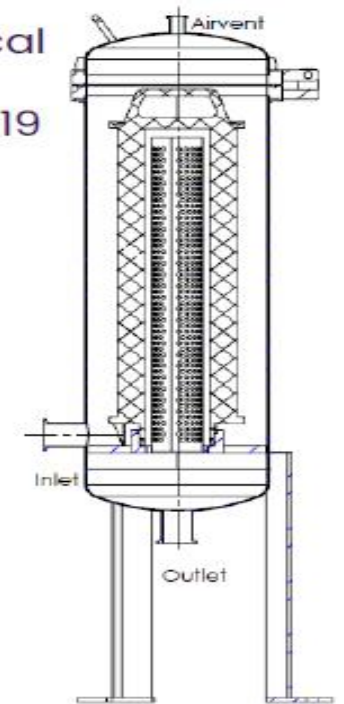
High Flow RF Housing

LPF

Graver High Flow RF Series filter housings are designed to accept Graver's and competitive High Flow RF Series large geometry filter elements. Available in both vertical and horizontal orientations, the High Flow RF housings are available in designs to accommodate from 1 to 15 filter elements, from 10" to 60" long. Constructed of 304 or 319 stainless steel, standard design is rated for 150 PSIG (10.3 bar) with higher pressure design available upon request.

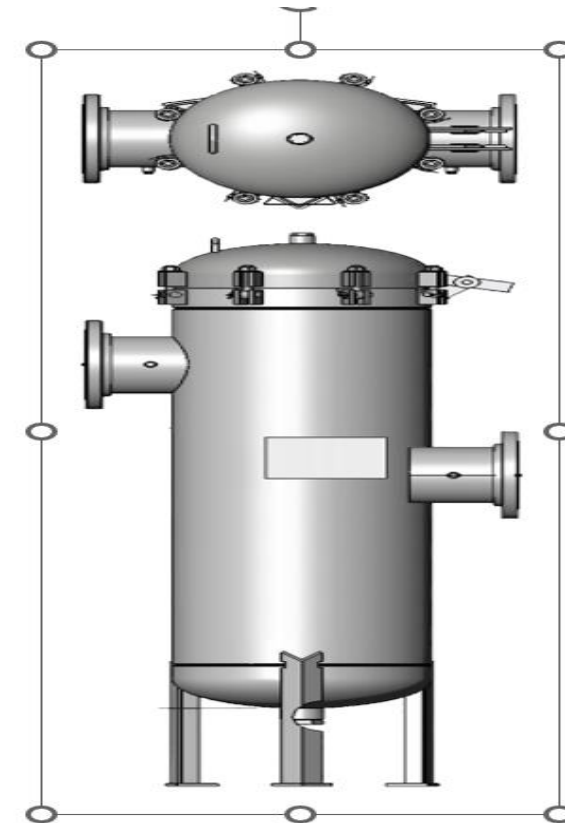
KEY FEATURES:

- Industrial grade housings available in 304L and 316L Stainless Steel wetted parts
- Designs for 1, 3, 4, 7, 10, 12, 15, filters per housing
- Single Round -Segment Screw hold down clamps; Multi-round -swing bolt hold down clamps
- 150 psig design
- Accepts 10", 20", 40" and 60" High Flow RF cartridges
- Vertical and horizontal designs available
- Vent and drain standard
- Hold Down plate prevents elements from unseating due to back pressure



LPF Housings

- ▶ High Flow Housings
 - 1, 3, 4, or 7 around
 - Handle flows up to 3500 GPM
 - Horizontal and vertical
 - ASME code available
 - Carbon or stainless steel
 - Quick Lead Times on Standard Sizes



High Flow Housing Configurator

Industrial Filtration

DO NOT CHANGE HIGHLIGHTED CELLS

Item	Model	Number of Filter Around	Orientation	Cartridge Height	Material of Construction	Inlet/Outlet Size	Inlet/Outlet Orientation	Pressure Rating	Gasket	Options	Surface Treatment	ASME Code Stamped	Recommended Model Number	Drawing Number	List Price
1	HFH	4	V	40	R	8	SS	150	E	H	PA	U	HFH 4V40R 8 SS 150EHPA - U	HFH-1V THRU HFH-7V	\$29,859.00
2				20									-		Selection not valid
3				40									-		Selection not valid
4				60									-		Selection not valid
5													-		Selection not valid
6													-		Selection not valid

Instructions:

20 - 20" length

40 - 40" length

60 - 60" length

1. Each Item number represents a line item on the quote sheet automatically.

2. Non-highlighted column titles have drop down menus. Follow the instructions and type in the available attribute in each column.

3. After entering the attributes per line, you may encounter a message that says "Selection not valid". This indicates that one or more of the attributes selected are incorrect or the selected product is not offered. Go back and change the attribute selection.

4. All prices are list price. Standard distributor discount is 30%. A warning appears when discount exceeds 30%, then asks you to re-enter. The discount is automatically applied to the price on the quote sheet.

5. Once a HFH product is successfully configured, enter the discount, contact, company, project and quote reference. These will auto-populate the quote found on the tab labeled "QUOTE".

6. On the quote page, type in the quantity required for each line item. The extended value will be calculated automatically.

7. On the quote page, lines 7 - 12 are reserved for manual entries, i.e. highflow cartridges and spare parts.

8. Enter the lead time on the quote page in the Delivery terms section.

9. On the QUOTE tab, press the print button to print a copy of the quote.

WHAT DISCOUNT DO YOU WANT TO APPLY?

Enter Discount %

Contact you are sending the quote to

Name of company receiving the quote

Project reference

Quote number

<

>

Literature Sales Sheet

Price Configurator

QUOTE

HFH-1H THRU HFH-7H

HFH-1HT SI-BO

HFH ...

+

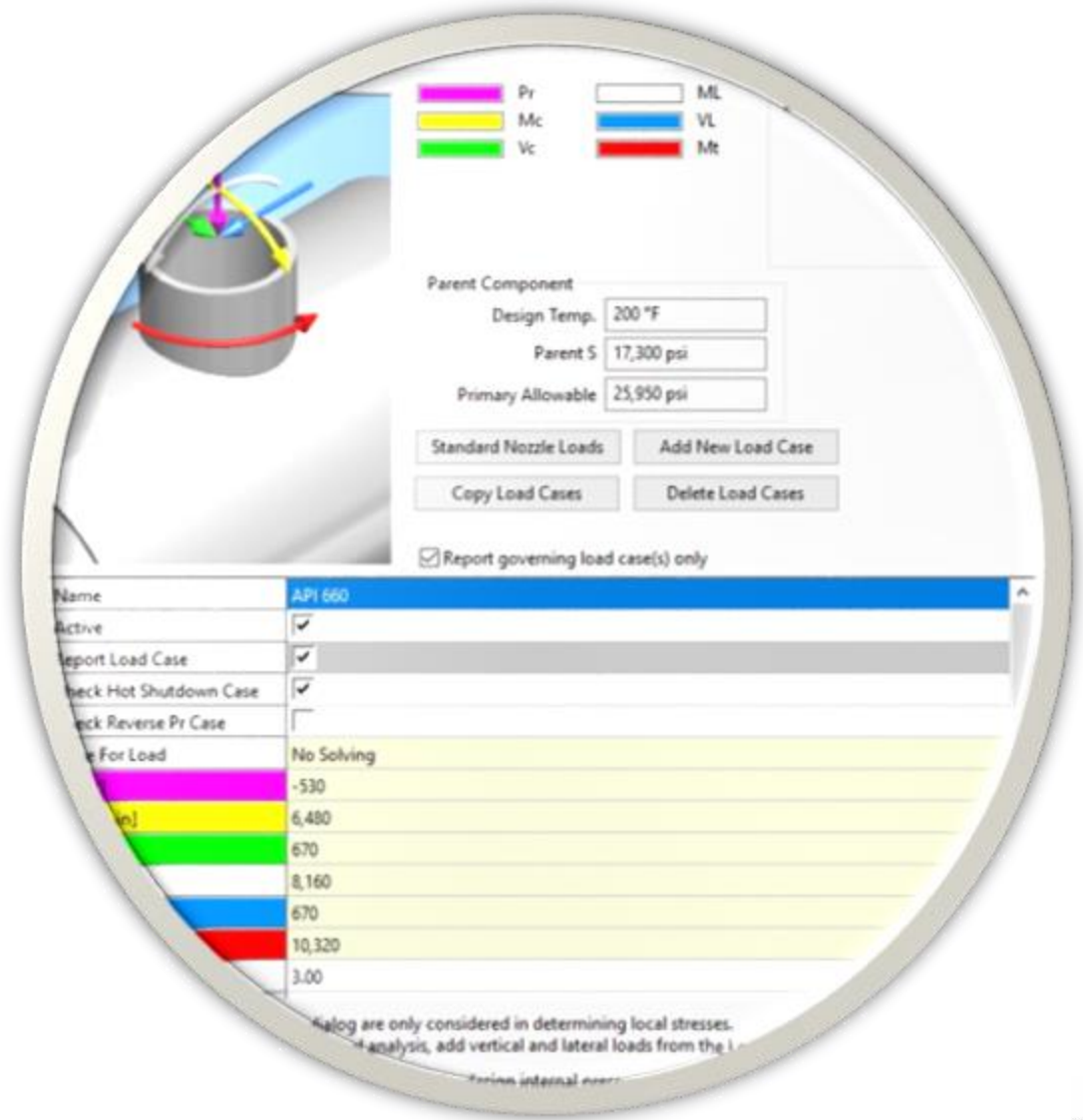
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Design Software Capabilities

Industrial Filtration

- Solidworks Design Suite
- 3D design capability
- 2D renderings for .DWG formatting
- CODEWARE – COMPRESS Pressure Vessel Code Calc software for ASME VIII



Typical Filtration Requirements

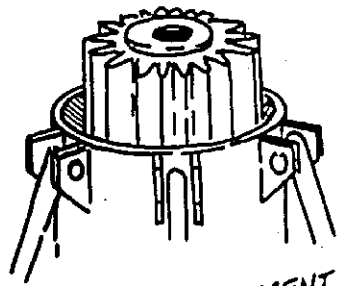
Industrial Filtration

- | | |
|-------------------------------------|----------------|
| • Industrial gases | 1-20 micron |
| • Chemical filters | 0.5-100 micron |
| • Fuel oil filters | 5-20 micron |
| • Natural gas filters | 1-10 micron |
| • Natural gas coalescers/separators | 0.3-10 micron |
| • Exhaust filters | 0.3-1 micron |

- ASME code design
- In-line connections
- Quick opening closure available
- Pleated element:
- Lower pressure drop, lower energy cost, higher flow rate, smaller housing/footprint
- Higher dust loading capacity: longer service interval, lower disposal cost
- Low number of elements:
- Fewer sealing surfaces to minimize risk of bypass
- Minimize maintenance time
- Large sump area
- Industry leading quality

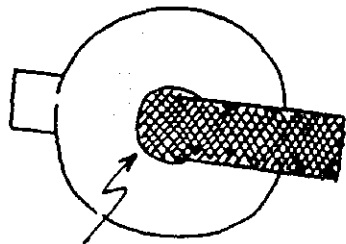
Features & Benefits

Industrial Filtration



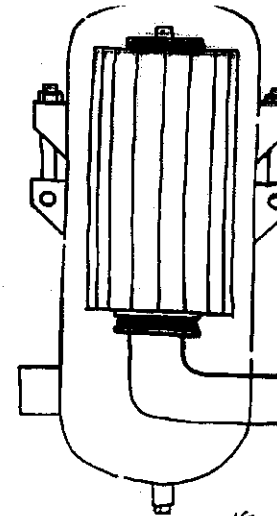
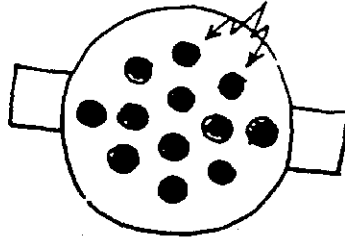
USUALLY ONE ELEMENT
(AT MOST THREE)

NUMEROUS CARTRIDGE
ELEMENTS TO SERVICE.



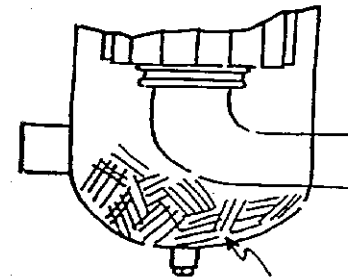
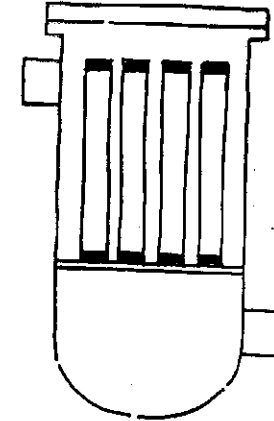
SINGLE
LARGE DISCHARGE FOR
LOWER PRESSURE DROP.

MULTIPLE HOLES IN DISCHARGE
PLATE RESTRICT FLOW RATIO
AND INCREASE PRESSURE DROP.



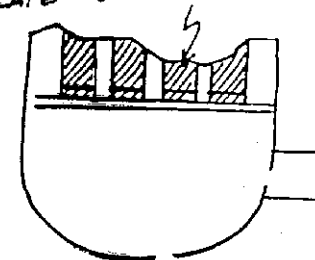
FEWER SEALING
SURFACES

EACH OF MANY CARTRIDGES
NEED SEALING... GREATER
POTENTIAL FOR BYPASSING.



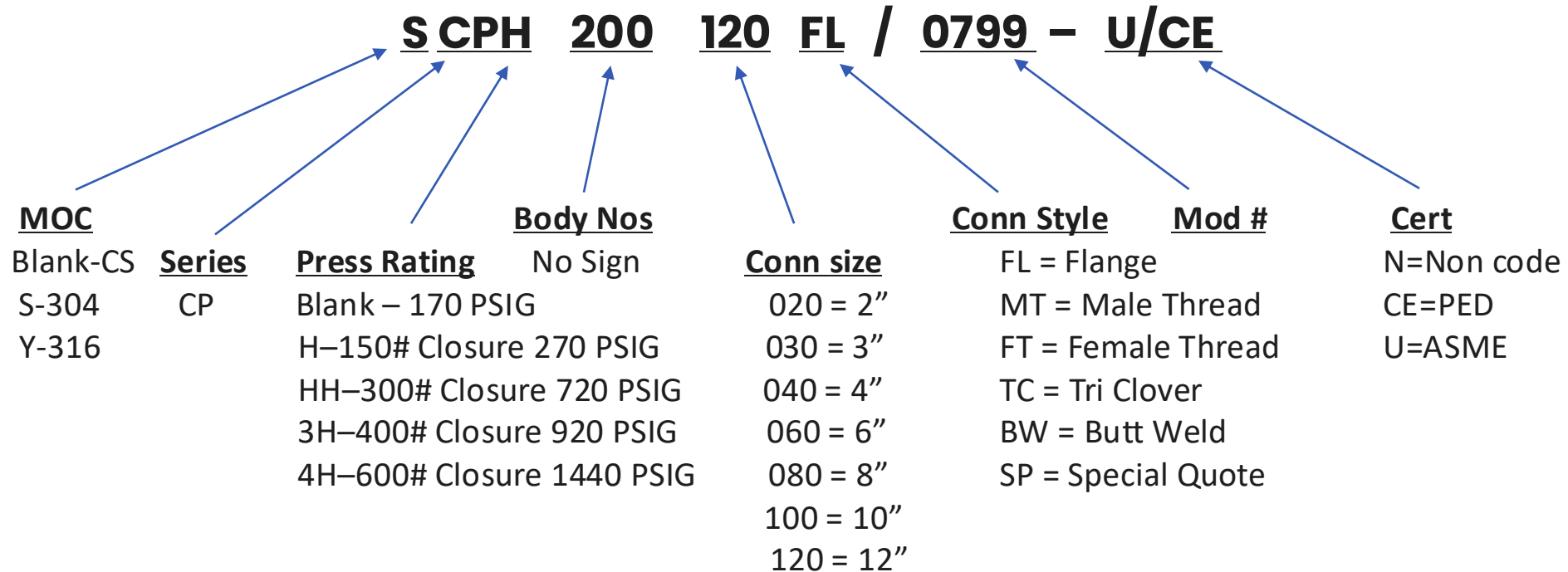
LARGE SUMP AREA TO
HOLD CONTAMINANTS -
EASY TO SERVICE.

POSSIBLE ELEMENT
BLOCKAGE BY CONTAMINANTS
SETTLING ABOVE DISCHARGE
PLATE - DRAINING DIFFICULT.



Housing Part Number Logic

Industrial Filtration



Example: CP4H-200-120-FL/SP-U

– “SP” indicates that this is a quoted vessel, different from standard or existing designs, new MOD# will be created ARO.

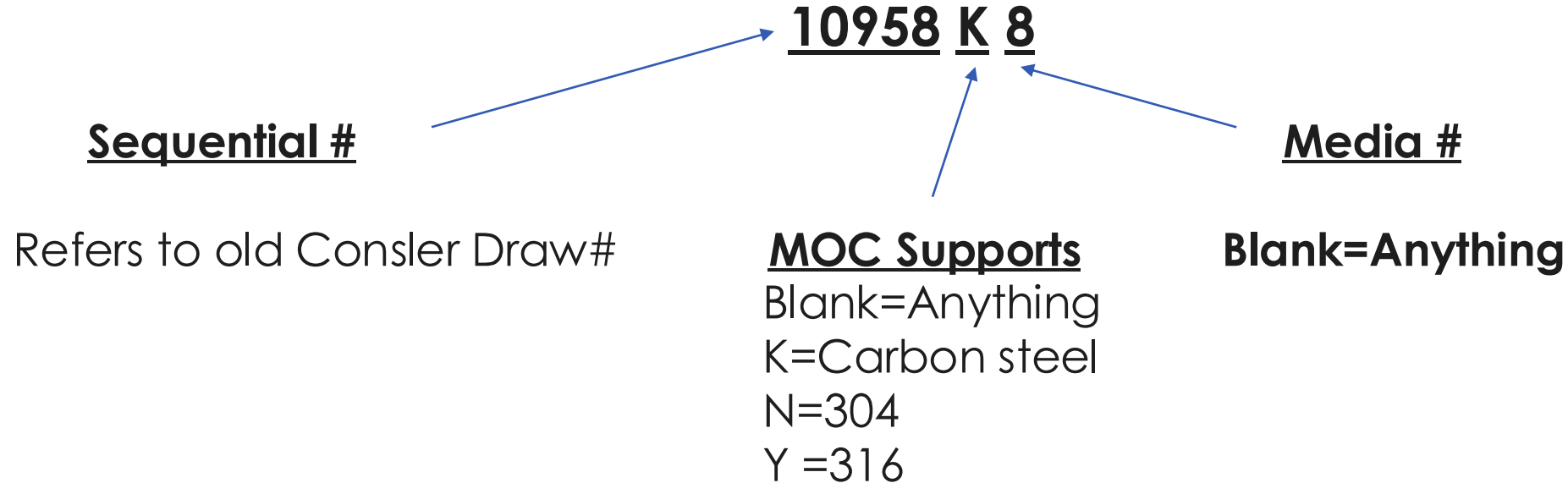
Housing Part Number Logic

Industrial Filtration

Carbon Steel ANSI Flange Ratings Temperature (in F°)	150# (H)	300# (HH)	400# (3H)	600# (4H)	900# (5H)	1500# (6H)	2500 # (7H)
< 100	285	740	985	1480	2220	3705	6170
200	260	680	905	1360	2035	3395	5655
300	230	655	870	1310	1965	3270	5450
400	200	635	845	1265	1900	3170	5280
500	170	605	805	1205	1810	3015	5025
600	140	570	755	1135	1705	2840	4730
650	125	550	730	1100	1650	2745	4575

Element Part Number Logic

Industrial Filtration



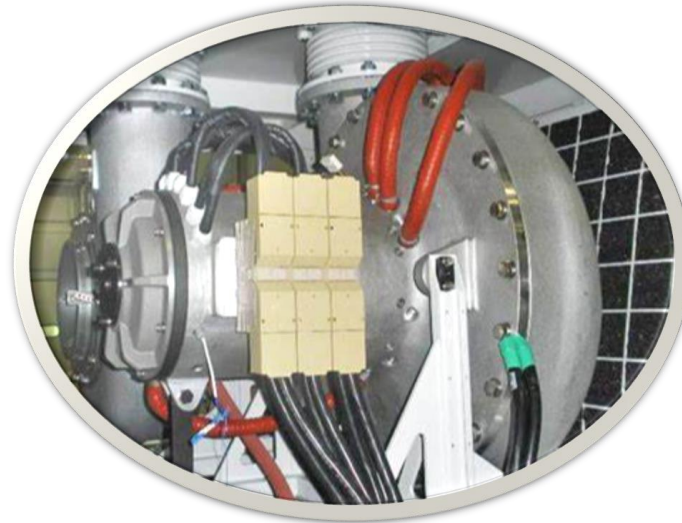
Elements above 22000 – usually means that it was a dedicated to one customer number

Markets

Industrial Filtration

Industrial

- Power
- Oil & Gas
- Chemical/Petro-Chemical
- Nitric Acid



OEM

- Vacuum Pump
- Centrifugal Blower
- Semi-Conductor

Industrial

- Residential Room Air Cleaner
- Aviation & Automotive
- Medical Devices
- Industrial Vacuums



Industrial Filtration



Power Generation

Power Generation

Industrial Filtration

Power Generation	Applications	Air Filter	Gas Coalescers	Gas Particulate Filter	Liquid Particulate Filter	High Flow Filter	Liquid Liquid Coalescing
	Gas Fuel		AGS	CP, GTX			
	Liquid Fuel				CPL, GTX		LLC
	Turbine Oil				CPL, GTX		LLC
	Air Intake	TPF Pre-Filter					
	Make Up Water					HFH	



Power Generation

Industrial Filtration

TPF® – GAS TURBINE PRE-FILTERS

- Graver's one-piece design thermally bond the seam without any glue, very easy to install and can be installed while turbine is running, and the patented removal strap design significantly reduces the pre-filter change out time and saves in labor costs. Graver's TPF is the fastest, cleanest and most reliable pre-filter available in the market!

AGS Filter/Coalescer Series

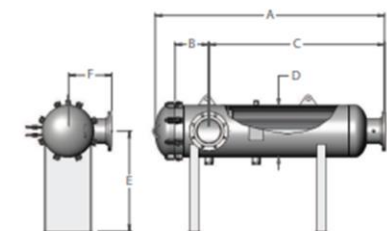
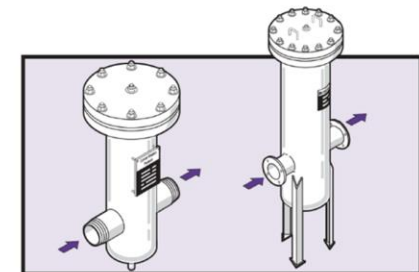
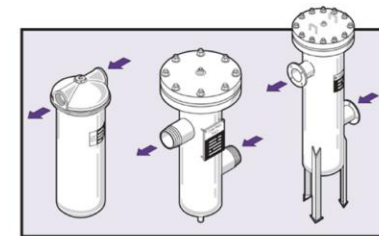
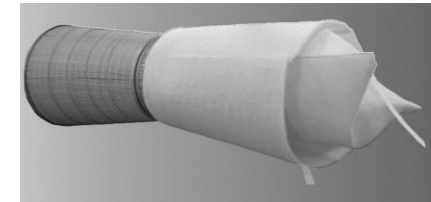
- AGS Filter/Separators are in line coalescing filters that are designed to remove liquid and solid contaminants from compressed air and gas streams. The AGS series offers multi-layer fiberglass coalescing elements. Our units can be designed for both single and multistage designs.

CP & GTX Particulate Filter Series

- The CP Series are in-line filters that are designed to remove solids from compressed air and gas streams. The element features a molded radial fin design that provides maximum surface area to allow for long service life with very low pressure drop, especially with our superior 709 grade media.
- The GTX Series filters utilize internal O-ring instead of a flat face gasket to seal the element. This design also provides very low maintenance and easy element change-outs.

High-Flow Housing

- Graver High Flow Series filter housings are designed to accept Graver and competitive High Flow Series large geometry filter elements. Available in both vertical and horizontal orientations, the High Flow housings can accept from 1 to 7 filter elements. Also available is a single round tipped horizontal design that allows easier removal without the need for a platform and readily drains from back of vessel to eliminate fluid spills.



Industrial Filtration



Oil & Gas

Oil & Gas Applications

Industrial Filtration

	Applications	Gas Coalescer	Gas Particulate Filter	Liquid Particulate Filter	High Flow Filter	Liquid Liquid Coalescer
Gas Processing	Gas Sweetening	AGS		CPL, GTX		LLC
	Compressor Protection	AGS	CP, GTX	CPL, GTX		
	Compressor Outlet	AGS	CP, GTX			
	Flow Meter Protection	AGS	CP, GTX			
	Fuel Gas Filtration	AGS	CP, GTX			
	Glycol Dehydration	AGS		CPL, GTX		
	NGL Condensate stabilization				HFH	
Pipeline Transmission	Compressor Protection	AGS	CP, GTX	CPL, GTX		
	Compressor Outlet	AGS	CP, GTX			
	Flow Meter Protection	AGS	CP, GTX			
	Fuel Gas Filtration	AGS	CP, GTX			
	NGL Pump Station			CPL, GTX		LLC
Refining	Gas/Liquid Sweetening	AGS	CP, GTX	CPL, GTX		LLC
	Burner Protection	AGS	CP, GTX			
	Fuel Gas Filtration	AGS	CP, GTX			
	Glycol Dehydration	AGS		CPL, GTX		
Natural Gas Distribution	Compressor Protection	AGS	CP, CP-LT, GTX	CPL, GTX		
	Compressor Outlet	AGS	CP, CP-LT, GTX			
	Flow Meter Protection	AGS	CP, CP-LT, GTX			

GAS PROCESSING & REFINING

Industrial Filtration

AGS Filter/Coalescer Series

- AGS Filter/Separators are in line coalescing filters that are designed to remove liquid and solid contaminants from compressed air and gas streams. The AGS series offers multi-layer fiberglass coalescing elements. Our units can be designed for both single and multistage designs.

CP Particulate Filter Series

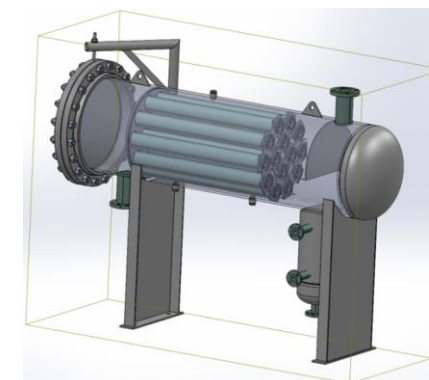
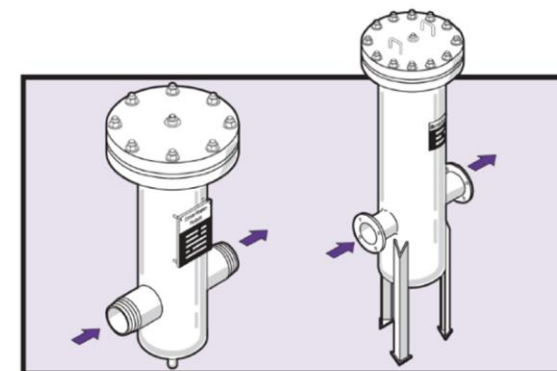
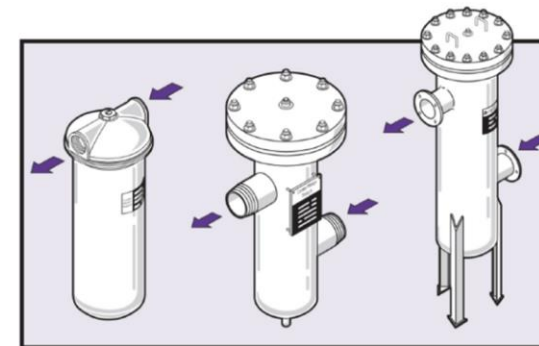
- The CP Series are in-line filters that are designed to remove solids from compressed air and gas streams. The element features a molded radial fin design that provides maximum surface area to allow for long service life with very low pressure drop, especially with our superior 709 grade media.

CPL Liquid Filters

- The CPL Series filters are designed to remove solid particle contaminants such as dirt, scale, and deposits. For efficient removal of dirt, pipe scale, and other solid matter from low and high pressure liquid pipelines.

LLC Liquid-Liquid Separator

- It is important to separate liquid-liquid emulsions in oil & gas, and chemical industries, insufficient separation of liquid containment would cause problems in downstream processes or even final products. Graver Technologies' Liquid-Liquid Coalescer/Separator removes water from hydrocarbons, such as diesel, gasoline, kerosene, LPG, etc.



PIPELINE TRANSMISSION & DISTRIBUTION

Industrial Filtration

AGS Filter/Coalescer Series

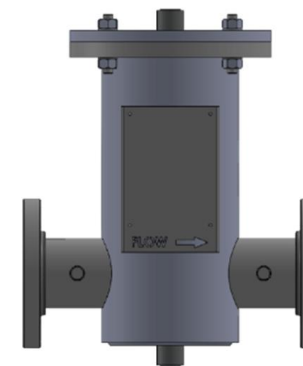
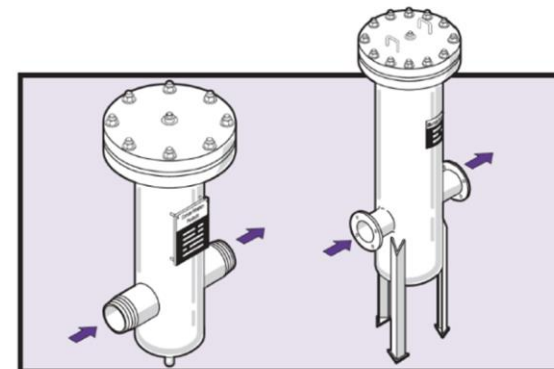
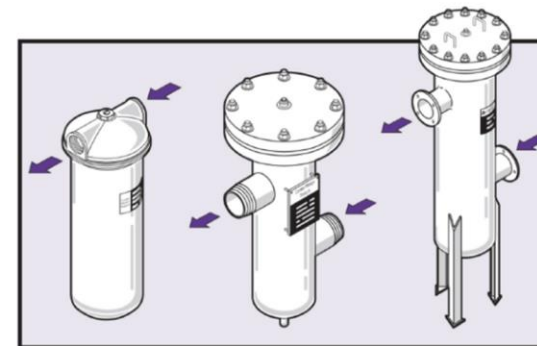
- AGS Filter/Separators are in line coalescing filters that are designed to remove liquid and solid contaminants from compressed air and gas streams. The AGS series offers multi-layer fiberglass coalescing elements. Our units can be designed for both single and multistage designs.

CP Particulate Filter Series

- The CP Series are in-line filters that are designed to remove solids from compressed air and gas streams. The element features a molded radial fin design that provides maximum surface area to allow for long service life with very low pressure drop, especially with our superior 709 grade media.

CP-LT Particulate Filter Series

- The CP-LT series is the light version of our industry leading ASME code stamped CP series filter and is specially engineered for natural gas distribution application. This non code product line is designed and manufactured within our ASME code environment and can be code stamped if needed.
- The well-designed CP-LT filters utilize a single energized O-ring to seal the SOE (Single Open End) element for better sealing, compare to most competitors use two flat gaskets to seal DOE elements. The filters are also designed to offer our customers easier and quicker service for lower labor cost and faster ROI (Return On Investment).

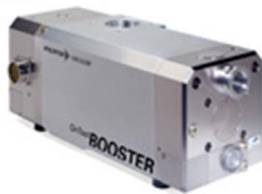


OEM	Applications	Coalescer	Particulate Filter	Retrofit Filter Element	HEPA/ULPA	Active Carbon Adsorbent
Asset Protection	Centrifugal Blower		CA/PFS	Available	Available	Available
	Semi-Conductor		HKV/LKV	Available	Available	Available
	Vacuum Pump	PME/FE	HKV/LKV	Available	Available	Available



We protect the critical vacuum pump that is on the MOCVD Tools.

Filter housing is located behind this panel protecting the vacuum pump



Vacuum Pump



LEDS processed here

Operator loads raw materials and removes LEDES from here when complete

Filter Housings:

- **Suction Filters** – Used to protect vacuum pumps from process debris and particles
 - LKV – Used for applications above 1 torr
 - HKV – Used for applications below 1 torr
 - Carbon Steel, 304, 316
- **Exhaust Filters** – Used to remove oil/smoke from reciprocating vacuum pumps
- Custom designs available

Filter Elements:

- High Temperature – up to 500°F/260°C
- Available in polyester and fiberglass
- 10 µm nominal, other micron ratings available
- Fit Aixtron and Veeco MOCVD Tools, custom designs available



Air Purification

Industrial Filtration

AIR PURIFICATION	Applications	Coalescer	Particulate Filter	Retrofit Filter Element	HEPA/ULPA	Active Carbon Adsorbent
Medical Devices	Biological Safety Cabinets				HEPA/ULPA	PLEKX®
	Device Disinfection Stations					PLEKX®
	Negative Pressure Isolation Rooms				HEPA/ULPA	
	Surgical Smoke & Odor Removal					PLEKX®
	Surgical Respirator Systems				HEPA/ULPA	PLEKX®
Aviation & Automotive	Aircraft Cabin Air Filter				HEPA/ULPA	
	Automotive Cabin Air Filter					PLEKX®
	Respirators (PPE)				HEPA/ULPA	PLEKX®
Room Air Purification	High Efficiency Filter Cartridge				HEPA/ULPA	
	Odor Elimination					PLEKX®
Industrial Vacuums	Dust Collector		Standard			
	High Efficiency Dust Collector				HEPA/ULPA	

Custom OEM Filters

(including HEPA & ULPA)

Industrial Filtration

Widely used in different applications

HEPAfine® and ULPAfine® filters are used in a wide variety of applications, and each application is unique. At Graver Technologies, we take extreme measures ensuring our customers with quality and certified products with efficiencies up ranging from 99.97% at 0.3µm to 99.999% at 0.12 µm.

- Industrial vacuum cleaners
- Biological safety cabinets, Surgical respirator systems, and other medical environments
- Cabin air filters
- Room air purifiers

Endcap/frame materials:

- Metal end caps
- Molded PVC/urethane end caps
- Chipboard frames
- Galvanized carbon steel frames
- Extruded aluminum frames with mitered corners
- Specialty designs



PLEKX® Active Carbon Media

Industrial Filtration

	200 GSM	250 GSM	300 GSM	370 GSM	450 GSM	Applications
Standard Carbon		X	X	X	X	HVAC (odor removal), vacuum products, automotive cabin filters, residential air filters
Impregnated AG					X	Medical hood (disinfection stations, clean benches), automotive cabin filters, residential air filters
Impregnated FA			X		X	Residential air filters (special impregnated carbon for Formaldehyde removal)
Impregnated FG	X					Personal protection air filters (face masks)



Above are current active products, we can make any carbon loading levels with different impregnated carbon.

PLEKX® Active Carbon Media

Industrial Filtration

- High permeability, low pressure drop, thin, and pleatable.
- About 15x more carbon surface area compared to traditional carbon filter.
- Lighter weight vs. carbon blocks/beds.
- Uniform layer of bonded active carbon particles laminated between top and bottom sheets:
 - Carbon immobilized, but surface area NOT blocked by binder.
 - “Dust free” – particles bonded in the “sandwich”, cleaner manufacturing environment and end-user environment.
 - Eliminates channeling, settling or fluidizing – particles do not shift.
 - No voids – better filtering efficiency (vs. carbon blocks).



PLEKX® Active Carbon Media: Applications

Industrial Filtration

Cabin Air Filters



HVAC Odor removal



Personal Protection



Commercial & Industrial Vacuum Systems



PLEKX® Active Carbon Media: Applications

Industrial Filtration

Dept of Defense



**Disinfection
Stations**



**Clean Benches
and Biological
Hoods**



**Laser Surgery
Source Capture**

Water Treatment Plants

Industrial Filtration

YCP Series Oxygen Service Filters for Ozone Generation

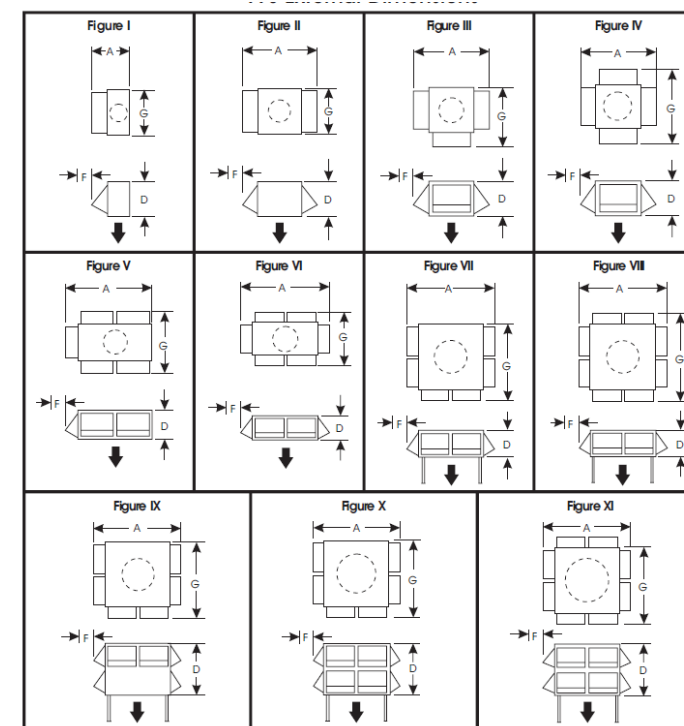
- Graver Technologies is very knowledgeable of designing and manufacturing ASME code stamped 316 stainless steel YCP series oxygen service filters, with full range of sizes offering from 1 inch connection size all the way to 12 inches.
- Graver has been working with industry leading ozone generator manufacturers for decades, with successful installations all around the world.

PFS Series Air Intake Filters

- The PFS Series air intake filters with pleated panel filter elements are designed to remove dust, dirt, and other airborne contaminants from high flow inlet air streams. Different configurations serve a broad range of air flow rates for aeration at WWTP.

Odor Control at WWTP

- PLEKX® active carbon media technology can be used for odor removal at Wastewater Treatment Plants.



Industrial Filtration



Questions?