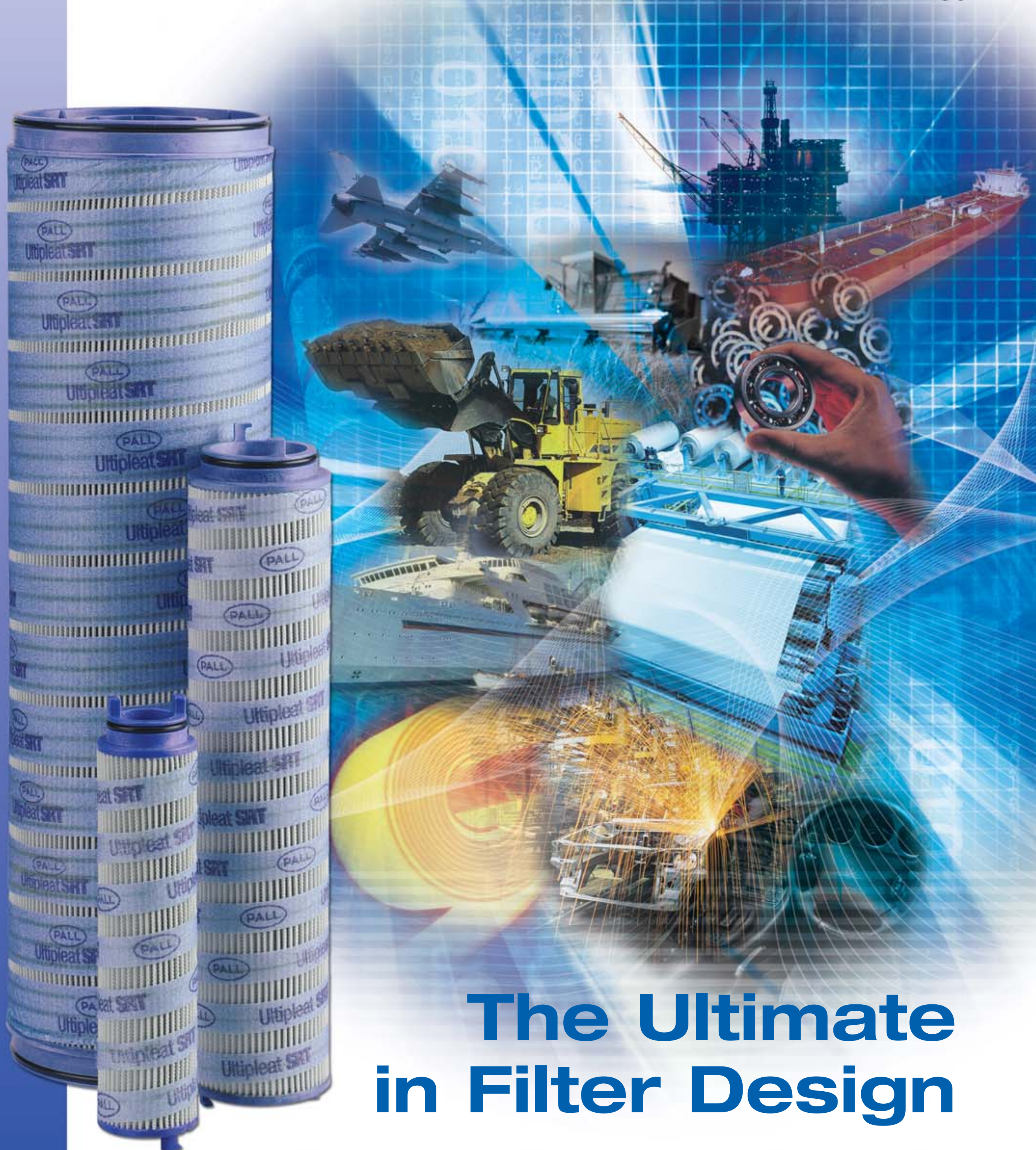
Pall Corporation

Ultipleat® SRT Filters

Stress Resistant Technology



The Ultimate in Filter Design

Filtration. Separation. Solution.SM

Ultipleat® SRT Filters

Pall's Ultipleat SRT hydraulic and lube filter elements combine an innovative media pack design and stress-resistant media technology to provide the greatest overall performance and value.

- Superior contamination control over the service life of the filter element
- Enhanced performance under cyclic flow and pressure conditions
- High flow capability
- Optimum service life and envelope size

The Ultimate in Filter Design

Proprietary Wave-Shaped Pleat Geometry

- Maximizes filtration area
- Increases flow handling capability
- Reduces filter element size
- Creates uniform flow distribution through the filter element

Coreless/Cageless Construction

- 60% lighter than comparable filter elements with cores
- Reduces disposal costs (filter elements are incinerable, shreddable or crushable)

Stress-Resistant Filter Medium

- Improves fluid cleanliness consistency
- Improves performance in "real world" conditions

Anti-Static Construction

- Minimizes static charge generation and electrostatic discharge
- Prevents damage to filter element, housing, or fluid due to static discharge

In-To-Out Flow Path

- Reduces the chance of cross contamination during filter element change

Anti-Static Construction

Electrostatic charge can be generated by the flow of hydrocarbon fluids through porous media contained in a filter element. With low fluid electrical conductivity, this static charge can accumulate on the filter element and later discharge, causing noise and potential damage to the filter element, filter housing, or fluid.

Pall Ultipleat SRT filter elements *incorporate anti-static materials to reduce charge generation and virtually eliminate static discharges.*

Auto-Pull Filter Element Removal Mechanism

Ultipleat SRT filter assemblies feature Pall's unique Auto-Pull filter element removal mechanism, allowing easy element removal from the filter housing.

When the cover or tube (depending on assembly design) is unscrewed from the housing, tabs on the filter element endcaps fit into hooks in the housing. Thus, as the cover or tube is unscrewed, the filter element is automatically pulled from the tube. This eliminates the need to reach into the tube to grab an endcap or handle and manually pull out the element.

Great Things Come in Small Packages...

OEM Benefits:

- Smaller package size
- Increased machine reliability
- Reduced warranty costs
- Withstands system operating stresses

User Benefits:

- Increased system reliability
- Reduced operating costs
- Reduced filtration costs
- Reduced filter element size
- Environmentally friendly disposal

Medium Substrate Support Layer (not shown): Provides support for the medium and aids in drainage flow.

Benefit: Reliable, consistent performance

Up and Downstream Mesh Layers: Create flow channels for uniform flow through the filter.

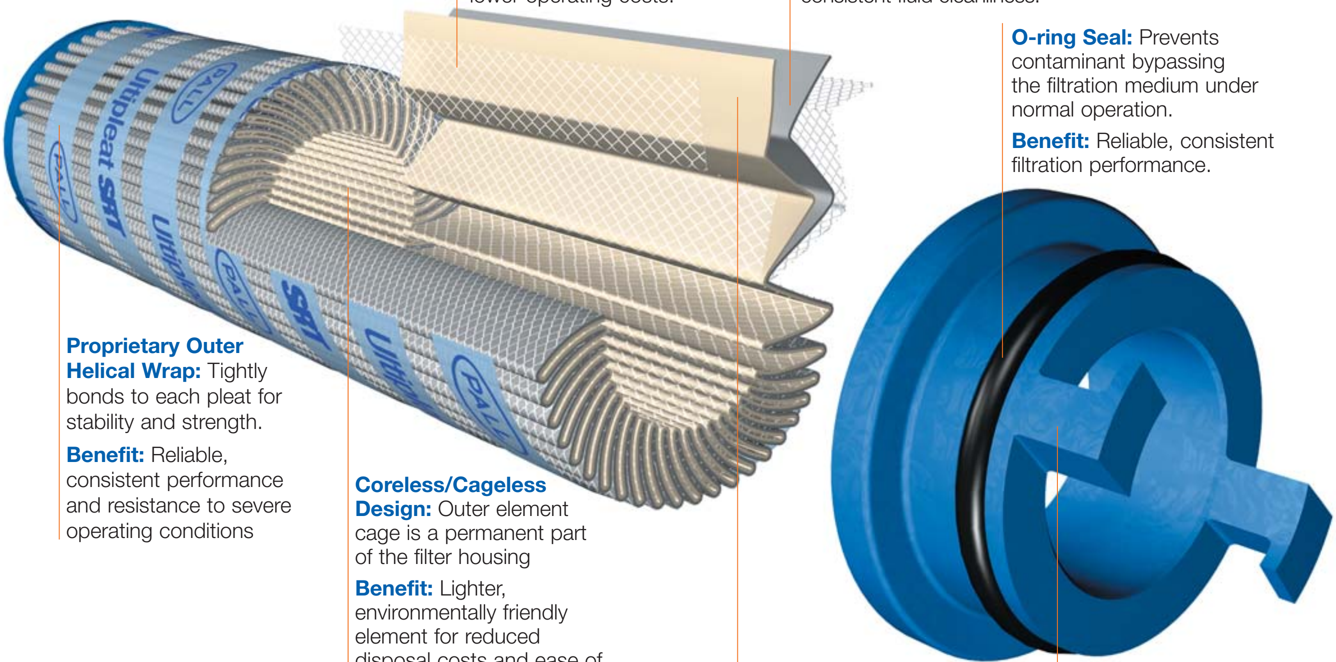
Benefit: Extended filter element service life for lower operating costs.

SRT Filtration Medium: Inert, inorganic fibers securely bonded in a fixed, tapered pore structure with increased resistance to system stresses such as cyclic flow and dirt loading.

Benefit: Improved performance over the service life of the filter element and more consistent fluid cleanliness.

O-ring Seal: Prevents contaminant bypassing the filtration medium under normal operation.

Benefit: Reliable, consistent filtration performance.



Proprietary Outer Helical Wrap: Tightly bonds to each pleat for stability and strength.

Benefit: Reliable, consistent performance and resistance to severe operating conditions

Coreless/Cageless Design: Outer element cage is a permanent part of the filter housing

Benefit: Lighter, environmentally friendly element for reduced disposal costs and ease of filter element change-out.

Proprietary Cushion Layer: Provides support for the medium and protection from handling.

Benefit: Reliable, consistent performance

Auto-Pull Element Removal Tabs: Corrosion-resistant endcaps feature exclusive Auto-Pull tabs for automatic element extraction upon opening the housing.

Benefit: Ease of filter element change-out.

SRT Filter Medium Feature	Advantage	Benefit
Stress-Resistant construction	• Increased stability under cyclic or dirt loading conditions	• Cleaner fluid under cyclic conditions • Consistent performance throughout the filter's service life
Anti-Static design	• Minimized static charge generation and no electrostatic discharges	• No damage to filter element or housing from static discharge
Uniform pore size control layer	• Maintains particle removal efficiency	• Cleaner fluid • Increased system protection
Tapered pore structure	• Dirt captured throughout the media depth	• Long filter service life
Epoxy bonded fiber matrix with small fiber size	• High particle removal efficiency • Consistent performance	• Cleaner fluid • Increased system protection

Table 1

The Shape of the Future

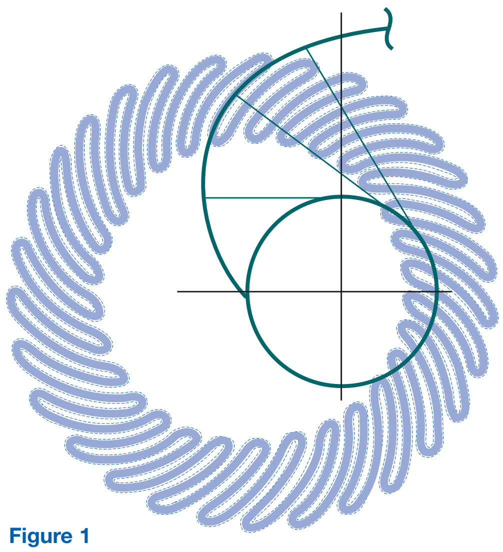


Figure 1

Key to the performance advantage in Ultipleat SRT filters is the wave-shaped pleat geometry.

Wave-shaped pleating:

- Allows more filtration area to be packed into a given filter element envelope
- Creates uniform flow distribution through the filter element
- Protects against pleat collapse and bunching

Mathematically Optimized Filter Area

Figure 1 represents the geometric model used to determine the optimal pleat shape to maximize filtration area. Pall has determined that a geometric "involute" shape, more simply described as a wave shape, yields maximum pleat area. This wave-shaped pleat geometry represents the ultimate in pleat design, thus the name "Ultipleat".

Avoid Unused Volume

As illustrated in figure 2, traditional straight or fan-pleated filter elements have their pleats radiate outward from the filter element core. As this occurs, spacing between the pleats increases, creating unused volume (spaces without filter media). With the wave-shaped pleat geometry of Ultipleat SRT filter elements (figure 3), there is no unused spacing between the pleats, and therefore no unused volume. In fact, **wave-shaped pleat geometry maximizes filtration area**.

Uniform Flow Distribution

Traditional fan-pleated filter elements are structured such that fluid flow is less restricted in some parts and more restricted in others (see figure 2). Fluid passing through the tips of the pleats must travel along a more restricted flow path than the flow passing through the root of the pleats. This is illustrated by the different sized flow arrows that show that most of the flow initially passes through the root of the pleats. This non-uniform flow distribution results in uneven dirt loading within the filter element during operation. In comparison, the pleats of Ultipleat SRT filter elements (figure 3) are designed to support each other along the entire length of the pleat. The total flow resistance is the same, regardless of where along the pleat the flow passes through the medium. This creates a uniform flow velocity through the filter element and, therefore, uniform buildup of dirt within the filtration medium. The result is greater dirt holding capacity and longer filter service life.

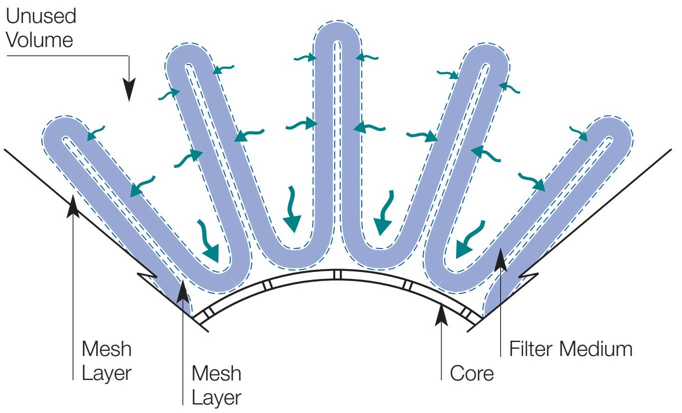


Figure 2. Conventional pleated filter element construction, showing Non-uniform flow distribution in a traditional fan-pleat filter

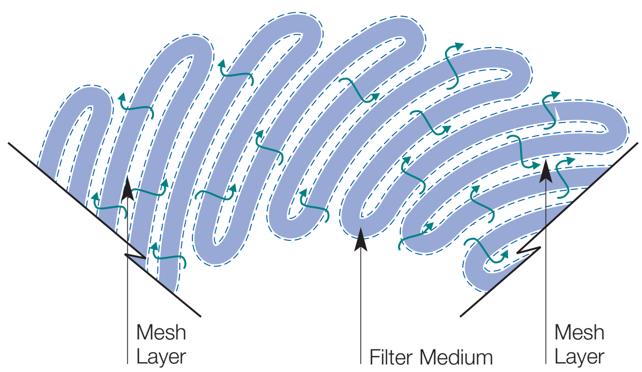


Figure 3. Ultipleat filter element construction, showing uniform flow distribution

The Ultimate in Filter Design

Pleat Stability

Figure 4 represents a poorly supported fan-pleat filter element subjected to high differential pressure or "cold start" flow conditions. The pleats tend to be unstable and can move, thus increasing pressure on the flanks of the pleats. The result can be pleat collapse and the "bunching" together of pleats, which reduces useable filtration area and filter service life. In contrast, the pleats in Ultipleat SRT filter elements touch and support each other (see figure 3) and are held in place via the helical wrap on the outside of the element. This results in long, consistent filter performance with uniform pleat spacing maintained.

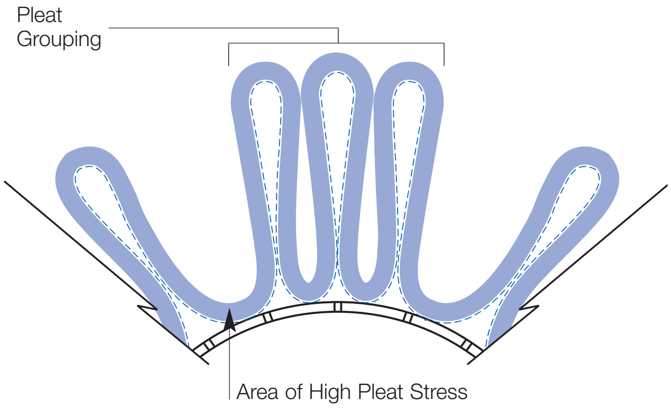


Figure 4. Pleat instability in a poorly supported filter element

Less is More (Smaller Element, Long Life)

The combination of maximized filter area, optimized pleat geometry, and uniform flow distribution in a stable, wave-shaped pleat geometry provides the benefit of significant filtration area compared to a traditional fan-pleat element of the same envelope size.

Of equal importance, these design features allow users to choose a smaller filter for an application and still obtain comparable filter element service life.

Figure 5 illustrates how a smaller Ultipleat SRT filter element can be used in place of a larger fan-pleat element. In the figure, the smaller Ultipleat SRT filter element has a slightly higher clean pressure drop, but the overall service life of the two different size filters is equivalent.

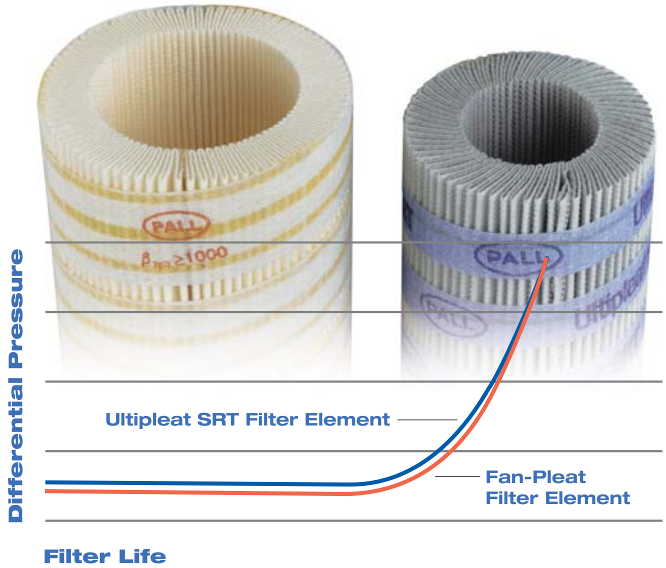


Figure 5. Filter life curve illustrating how a smaller Ultipleat SRT Filter element can achieve equivalent service life compared to a larger fan-pleat filter

Ultipleat SRT Filter Specifications

Element Collapse/Burst Rating (ISO 2941)

10 bard (150 psid)

Flow vs. Pressure Drop (ISO 3968)

See appropriate Ultipleat SRT housing literature.

Fluid Compatibility (ISO 2943)

Compatible with petroleum oils, water glycols, water-oil emulsions, and high water containing fluids. Fluorocarbon seals are available for industrial phosphate esters, diesters, and specified synthetics.

Flow Fatigue (ISO 3724)

Contact factory; filter element pleats are fully supported, both upstream and downstream to achieve excellent fatigue cycle life.

Fabrication Integrity (ISO 2942)

Fabrication integrity is validated and assured during the manufacturing process by numerous evaluations and inspections including Bubble Point testing.

Temperature Range

Fluorocarbon seals: -29˚C (-20˚F) to +120˚C (+250˚F)

Note: Maximum 60˚C (140˚F) in water based fluids.

Other seal materials available on application

Quality Control

All filter elements are manufactured by Pall to exacting procedures and strict quality controls. Filter elements are checked against rigorous ongoing validation test protocols within Pall Corporation. Pall is accredited to ISO 9001 and QS 9000.

Reporting Filter Performance

Ultipleat SRT Filter Performance Rated as an ISO 4406 Cleanliness Code

Ratings Problem

- ISO 16889 (Beta ratings) are derived under steady state conditions.
- Real world conditions including cyclic variations in flow, pressure and dirt loading can affect filters, leading to a decline in Beta value with increasing element pressure drop.
- ISO 16889 filter performance test cannot differentiate the ability of different filter elements to handle these cyclic stresses.

Ratings Solution

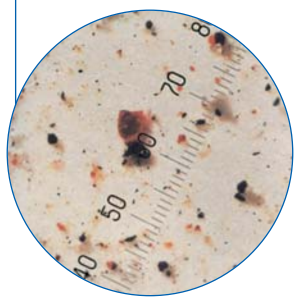
- Pall's Cyclic Stabilization Test (CST), based on SAE ARP 4205, applies cyclic flow (25 to 100% of rated flow) and contaminant loading during the test.
- CST ISO 4406 Cleanliness Code ratings are based on performance at 80% of the net terminal pressure drop, considered the worst operating condition.
- The stress-resistant design characteristics of Ultipleat SRT elements result in significantly lower ISO code ratings via the CST.

See The Difference:

- Shown right are photomicrographs representing the performance of 'similar' filters rated at 5 micron per ISO 16889 tested via the Cyclic Stabilization Test. Ultipleat SRT filters provide far superior particulate removal under the cyclic and dirt loading conditions.
- At 80% net terminal pressure drop, filter A is passing over 1200 times more 6 micron(c) and larger particles than the Ultipleat SRT filter, filter B 675 times more.

Filter A

ISO 4406 Cleanliness Code **20/17/13**

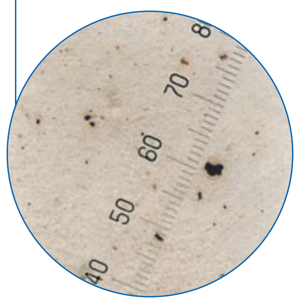


Particle Count Summary

Size	Particle Count per mL	ISO 4406 Code
>4 µm(c)	7,200	20
>6 µm(c)	970	17
>14 µm(c)	47	13

Filter B

ISO 4406 Cleanliness Code **19/16/11**

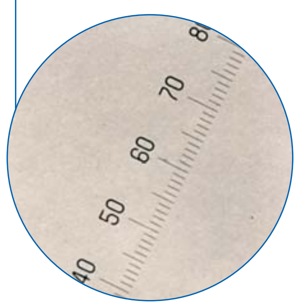


Particle Count Summary

Size	Particle Count per mL	ISO 4406 Code
>4 µm(c)	4,200	19
>6 µm(c)	540	16
>14 µm(c)	20	11

Ultipleat SRT

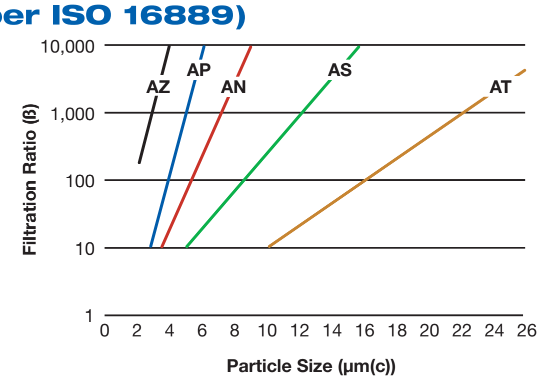
ISO 4406 Cleanliness Code **12/07/02**



Particle Count Summary

Size	Particle Count per mL	ISO 4406 Code
>4 µm(c)	25	12
>6 µm(c)	0.8	7
>14 µm(c)	0.02	2

Multi-pass filter ratings (per ISO 16889)



Cleanliness Code Ratings

Code	$\beta_{x(c)} \geq 1000$ per ISO 16889	CST Rating*
AZ	3	08/04/01
AP	5	12/07/02
AN	7	15/11/04
AS	12	16/13/04
AT	22	17/15/08

* CST: Cyclic Stabilization Test to determine filter rating under stress conditions, based on SAE ARP4205

Note these ISO codes are laboratory measurements under standard conditions. Cleanliness measured in actual operation will depend on operating conditions and sampling method.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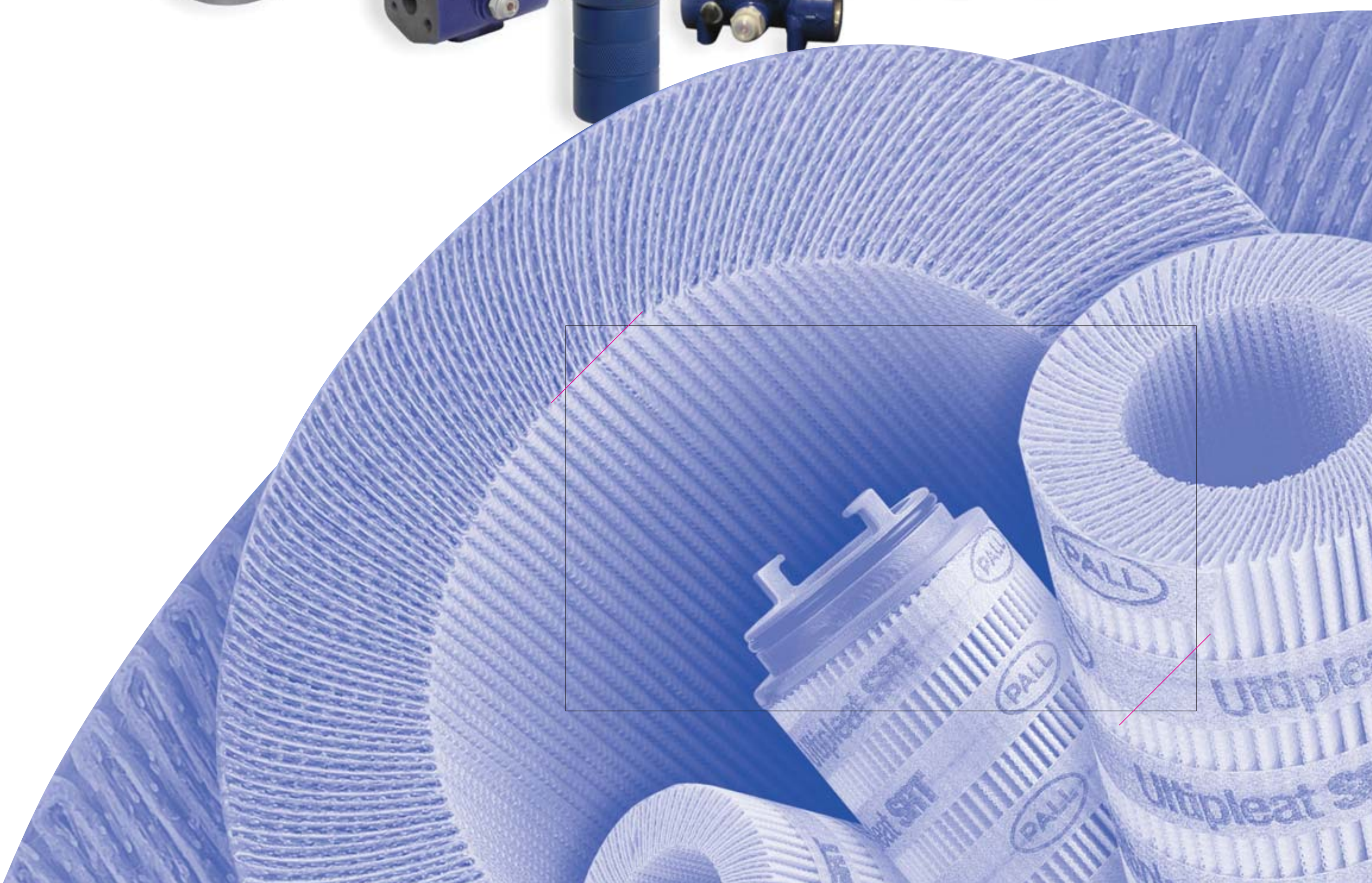
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