SCREEN AND BASKET SELECTION GUIDE

Choosing the right straining element

Introduction:

One of the most important design considerations when purchasing a strainer is specifying the perforation or mesh size of the straining element. The straining element (commonly referred to as a screen for WYE strainers and a basket for basket strainers) is a mechanical filter which removes and retains particles too large to pass through yet allows the flowing media (liquid or gas) to pass unobstructed. This process is illustrated in Figure 1. By cleaning the flowing media, the straining element helps to protect expensive downstream equipment such as pumps, meters, spray nozzles, compressors, and turbines.

> A Titan FCI stainer should always be installed ahead of pumps and other expensive, downstream equipment to help ensure proper protection and trouble-free operation. This even holds true for "clean lines" to protect against scale and accidentally introduced items such as: tools, gaskets, nuts, or bolts.

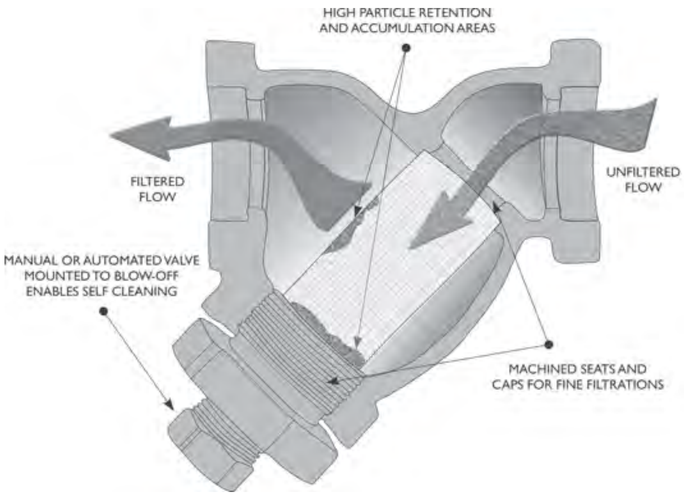

Figure 1: Straining Illustration

Determining Opening Size:

In general, screen openings should be approximately one-half the diameter of the largest allowable particle. The largest allowable particle is defined as the size of particle that can pass through downstream equipment without causing damage. For example, if the maximum allowable particle is 1/16 inch than the screen opening would be specified at 1/32 inch. In addition to the size of particles, the quantity of debris in the flowing media must also be considered when determining the appropriate opening size.

Straining elements can only be used to remove insoluble floating impurities. The most common range of particle retention is 1 inch down to 40 microns (.0015 inch). See Figure 2 for a comparison of sizes for a variety of common particles.

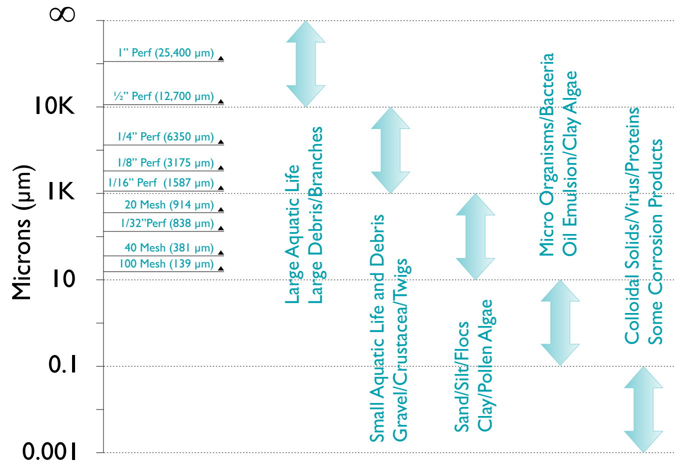

Figure 2: Particle Size Comparison Chart

Determining Opening Size: continued...

A common mistake is to specify a screen opening that is to small for the application. This can lead to overstraining and should be avoided for the following reasons:

- Maintenance costs are significantly increased due to excessive cleaning requirements.
- Pressure drop is increased dramatically.
- The straining element may become damaged and fail.

> Straining elements are not designed to withstand the same pressure as the strainer housing. If the straining element becomes fully clogged, it will be exposed to the same pressure as the housing. In most cases, this will cause the straining element to fail. For these types of applications, Titan FCI offers special drilled or wedge wire screens that can withstand full line pressure when clogged. A convenient way to monitor the differential pressure is to install pressure gauges on both the inlet and outlet sides of the strainer. It is not recommended to allow the differential pressure to exceed 20 psi.

In some applications requiring finer filtrations, it may be advisable to strain in gradual steps. This is accomplished by placing progressively smaller straining elements in series. As always, a Titan FCI engineer is available to assist you in developing a solution for any special straining requirements you may have.

Construction Material:

Irregardless of the strainer housing material being used, the most common construction material used for straining elements is stainless steel. This is due to the inherent resistance to corrosion stainless steel provides. As such, Titan FCI's standard construction material for all straining elements is Type 304 stainless steel. Other materials (316 SS, 316L, and Monel) are available upon application. Please consult a Titan FCI engineer for determining the best material for your application.

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Titan Flow Control - Screen and Basket Types

Screen Types:
In general, strainer elements are available in three types: *perforated*, *wire mesh*, and *reinforced wire mesh lined*.

Perforated:
Titan FCI offers a wide range of perforation sizes. To make the selection process easier, Titan FCI recommends a standard perforation size suitable for general service for each type of strainer. The standard perforation size has been determined to provide the best balance of open area ratio (OAR), hole arrangement, and gauge thickness that results in the least amount of pressure drop. Please refer to each strainer's specification sheet for standard perforation size recommendations. Additionally, Table 4 presents a general guide for selecting straining element sizes for water, steam, oil, gasoline and air.

Where permissible, Titan FCI uses a 60° staggered round hole arrangement because of its superior strength and large open area ratio (OAR). On smaller perforation sizes, Titan FCI uses a straight line, round hole pattern that allows for a large OAR yet does not compromise gauge thickness. In general, as the hole diameter becomes smaller and the OAR increases, the gauge thickness inherently becomes thinner.


60° Staggered Round Hole Arrangement

Wire Size Diameters and Washburn & Moen Gauge Equivalents

Inch	Gauge
.120	11 Ga.
.105	12 Ga.
.092	13 Ga.
.080	14 Ga.
.072	15 Ga.
.063	16 Ga.
.054	17 Ga.
.047	18 Ga.
.041	19 Ga.
.035	20 Ga.
.032	21 Ga.

Wire Mesh:
For finer straining applications, down to 40 micron, wire mesh straining elements are available. Titan FCI utilizes a mono-filament, plain square weave that exhibits large OAR and very low flow resistance. Other types of weaves, such as plain Dutch and Twilled Dutch weave, are also available upon request. As with perforated straining elements, Titan FCI has developed standard mesh sizes suitable for general service for each type of strainer. Unsupported wire mesh straining elements are only suitable for strainers under 2 inches in size, constructed of 20 or 30 mesh, and operating within low pressure applications (under 200 psi). For larger strainers, finer mesh sizes, and higher pressure applications reinforced mesh lined screens must be used.

Wire Mesh Lined:
In most cases, wire mesh straining elements are reinforced with a heavier gauge, perforated metal backing to provide additional support. Titan FCI's standard perforated metal backing is 5/32 inch which provides excellent support without significantly diminishing the OAR.

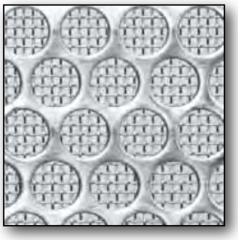

Wire Mesh with Perforated Backing

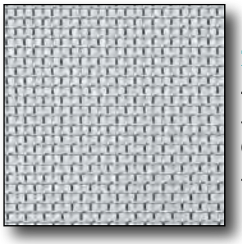
Table 1: Straining Element Selection Guidelines: [1]

Pipeline Media	Strainer Size	Coarse Straining	→	Fine Straining
Air or Gas	1/2" ~ 2"	1/32" perf.	60 mesh	100 mesh
	2 1/2" ~ 4"	1/16" perf.	3/64" perf.	60 mesh
	5" and up	1/8" perf.	1/10" perf.	40 mesh
Gasoline	1/2" ~ 2"	1/32" perf.	30 mesh	100 mesh
	2 1/2" ~ 6"	1/16" perf.	1/32" perf.	60 mesh
	8" and up	1/10" perf.	1/32" perf.	40 mesh
Oil - Low Viscosity	1/2" ~ 2"	1/16" perf.	1/32" perf.	30 mesh
	2 1/2" ~ 6"	3/16" perf.	1/8" perf.	1/16" perf.
	8" and up	3/8" perf.	1/4" perf.	1/8" perf.
Oil - Medium Viscosity	1/2" ~ 2"	1/10" perf.	1/16" perf.	20 mesh
	2 1/2" ~ 6"	1/4" perf.	3/16" perf.	1/8" perf.
	8" and up	3/8" perf.	1/4" perf.	3/16" perf.
Oil - High Viscosity	1/2" ~ 2"	1/8" perf.	1/10 perf.	1/16" perf.
	2 1/2" ~ 6"	3/8" perf.	1/4" perf.	3/16" perf.
	8" and up	1/2" perf.	3/8" perf.	1/4" perf.
Steam	1/2" ~ 2"	1/32" perf.	30 mesh	60 mesh
	2 1/2" ~ 4"	3/64" perf.	1/32" perf.	30 mesh
	5" and up	1/16" perf.	3/64" perf.	1/32" perf.
Water	1/2" ~ 2"	1/32" perf.	20 mesh	30 mesh
	2 1/2" ~ 4"	1/8" perf.	1/16" perf.	3/64" perf.
	5" and up	1/4" perf.	1/8" perf.	3/64" perf.

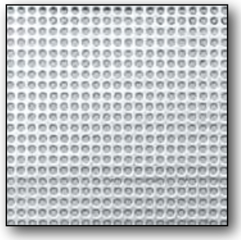
1. Represents a general guide for the selection of strainer element sizes. Should not be taken as an absolute guide as each particular application introduces its own set of unique requirements. When in doubt, please contact a Titan FCI engineer.

Titan Flow Control - Perforation and Mesh Configurations

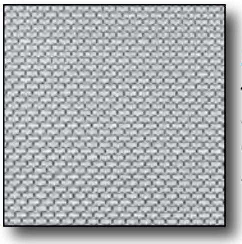
Table 2: Standard Mesh and Perforated Configurations [1][2]



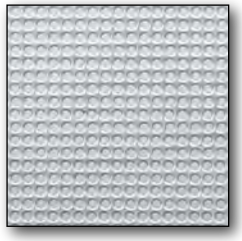
20 Mesh
51.8% Open Area
.036 Openings
(.914 mm / 914 µm)
.014 Wire Diameter



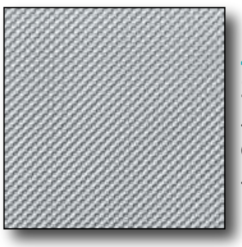
1/32" Diameter
(.033 in / 0.83 mm)
.055 Centers
28% Open Area
330 holes/sq. in.
Straight Line



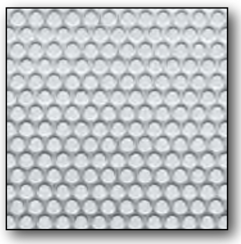
30 Mesh
44.8% Open Area
.0223 Openings
(.566 mm / 566 µm)
.011 Wire Diameter



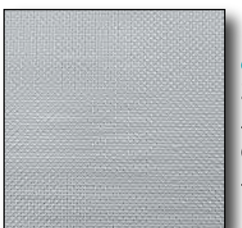
3/64" Diameter
(.045 in / 1.14 mm)
.066 Centers
36% Open Area
225 holes/sq. in.
Straight Line



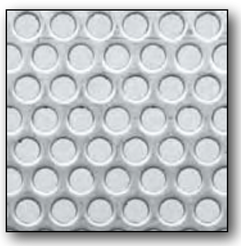
40 Mesh
36% Open Area
.015 Openings
(.381 mm / 381 µm)
.010 Wire Diameter



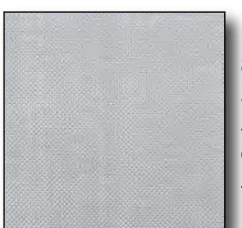
1/16" Diameter
(.0625 in / 1.58 mm)
3/32" Centers
41% Open Area
132 holes/sq. in.
Staggered Line



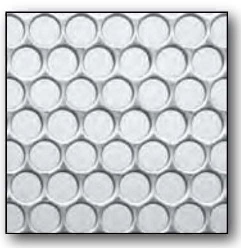
60 Mesh
33.9% Open Area
.0097 Openings
(.246 mm / 246 µm)
.007 Wire Diameter



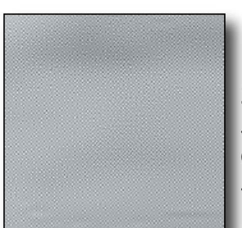
1/8" Diameter
(.125 in / 3.17 mm)
3/16" Centers
40% Open Area
33 holes/sq. in.
Staggered Line



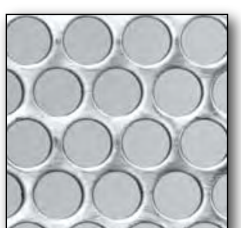
80 Mesh
36% Open Area
.0075 Openings
(.190 mm / 190 µm)
.005 Wire Diameter



5/32" Diameter
(.1563 in / 3.96 mm)
3/16" Centers
63% Open Area
33 holes/sq. in.
Staggered Line



100 Mesh
30.3% Open Area
.0055 Openings
(.139 mm / 139 µm)
.0045 Wire Diameter



1/4" Diameter
(.25 in / 6.35 mm)
5/16" Centers
58% Open Area
12 holes/sq. in.
Staggered Line

Table 3: Optional Mesh Configurations [3]

Mesh (Linear inch)	Wire Dia. (in)	Hole Openings (in)	Hole Openings (µm)	Open Area (%)
20	.016	.034	863	46.2
20	.023	.027	685	29.2
30	.010	.0233	591	48.9
30	.014	.0193	490	33.5
40	.009	.016	406	41.0
40	.011	.014	355	31.4
50	.009	.011	279	30.3
60	.0065	.0102	259	37.5
60	.0080	.0087	221	27.2
80	.0055	.0070	177	31.4
80	.0060	.0065	165	27.0
100	.0040	.0060	152	36.0
100	.0045	.0055	139	30.3
120	.0037	.0046	116	30.7
130	.0034	.0043	109	31.1
140	.0029	.0042	106	34.9
150	.0026	.0041	104	37.4
160	.0025	.0038	96	36.4
170	.0024	.0035	88	35.1
180	.0023	.0033	83	34.7
200	.0021	.0029	73	33.6
325	.0011	.0020	50	42.0
400	.0010	.0015	38	36.0
500	.0010	.0010	25	25.0

Table 4: Optional Perf. Configurations [3]

Hole Diameter (in)	Centers (in)	Open Area (%)
.027	.05 Straight	23.0
.045	.066 Straight	36.0
.045	.088 Staggered	24.0
1/16	7/64 Staggered	30.0
1/16	1/8 Staggered	22.5
5/64	7/64 Staggered	46
5/64	1/8 Staggered	36
3/32	5/32 Staggered	33.0
3/32	3/16 Staggered	25.0
3/32	1/4 Straight	12.7
.100	5/32 Staggered	36.0
.117	5/32 Staggered	51.0
1/8	7/32 Staggered	30.0
1/8	1/4 Staggered	23.0
9/64	3/16 Staggered	51.0
5/32	1/4 Staggered	34.0
3/16	1/4 Staggered	50.0
3/16	5/16 Staggered	33.0
3/16	1/2 Straight	10.0
7/32	5/16 Staggered	45.0
1/4	3/8 Staggered	40.0
1/4	1/2 Staggered	23.0
1/4	1/2 Straight	20.0
5/16	7/16 Staggered	46.0
3/8	1/2 Staggered	52.0
3/8	9/16 Staggered	40.0
7/16	5/8 Staggered	45.0
1/2	11/16 Staggered	48.0
1/2	3/4 Staggered	40.0

Notes:

1. Titan FCI's standard construction material for all screens and baskets is Type 304 Stainless Steel. Other materials (i.e. Type 316 and Monel) are available upon request. Please consult factory for pricing and availability for non-stock materials.
2. Table 2 represents Titan FCI's most commonly stocked mesh and perforation arrangements. A large variety of special mesh and perforation options are available. Please consult the factory or your local sales representative regarding the specific requirements of your application.
3. Table 3 & 4 represent optional mesh and perf configurations which are not routinely stocked but can be furnished upon request. Please consult factory for pricing and availability.
4. For mesh lined screens or baskets, 5/32" perf is most commonly used for outer support (backing). If other backing is required, please specify at time of order.

Titan Flow Control - Standard Screen and Basket Designs

Titan FCI can manufacture straining elements for all types of strainers including "Y", "T", and basket in a wide variety of materials. We can also manufacture conical/temporary strainers.

Please send us your prints, samples, or simply give us your requirements and let us design a straining element for you. In most cases, straining elements can be ordered by referencing Titan FCI's or any other manufacturers' strainer model number.

When ordering, please specify:

1. Pipe Size
2. Straining Element Type
3. Perforation or Mesh
4. Construction Material
5. Design Type (cone, basket etc.)
6. Flow Direction
7. Open Area % and Length
8. Pressure Ratio

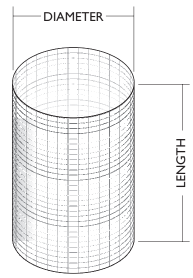


Figure 3:
STYLE 'A'
Cylindrical Screen
Generally used for "Y" Type Strainers.

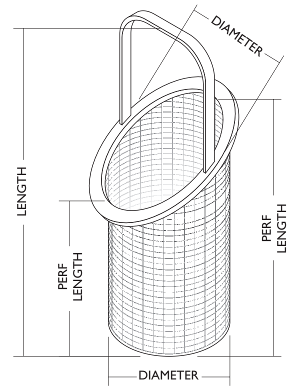


Figure 4:
STYLE 'B'
Slanted Type Basket
Typically used for larger sized Simplex and Duplex Basket Strainers. Slanted inlet side reduces pressure drop across the strainer. Strainer cover presses down on handle to ensure straining element remains securely seated.

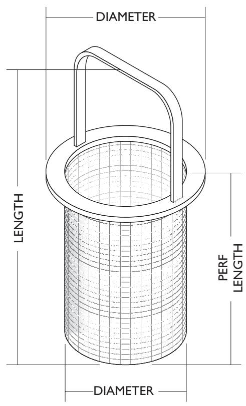


Figure 5:
STYLE 'C'
Basket Type
Typically used for smaller sized Simplex and Duplex Basket Strainers. Strainer cover presses down on handle to ensure straining element remains securely seated.

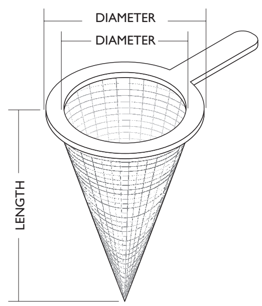


Figure 6:
STYLE 'D'
Temporary Conical
Often referred to as a cone or witch's hat strainer. Used during start-up operations.

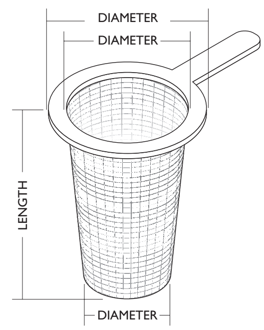


Figure 7:
STYLE 'E'
Temporary Basket
Often referred to as a basket or pilgrim's hat strainer. Used during start-up operations.

Screen Specification Sheets are available online at ***http://www.titanfci.com/technical-data/screen-selection/screen-and-basket-specifications***

Titan Flow Control - Special Screen and Basket Designs

Magnetic Screen Assembly:

Magnetic screen assemblies are recommended for applications that require the removal and retention of microscopic ferrous particles. Virtually any Titan FCI strainer can be fitted with powerful ALNICO magnetic inserts to provide protection against both magnetic and non-magnetic particles. These magnetic inserts create a continuous magnetic field within the interior of the straining element trapping ferrous particles even the finest mesh would typical not remove. Magnetic screen assemblies can effectively be employed in lubrication systems, hydraulic systems, and machine coolant systems.

Special Drilled or Wedge Wire Screens:

Titan FCI can also fabricate straining elements that will withstand full line pressure when clogged. These straining elements have individually drilled holes in heavy gauge metal (up to 3/8" thick) or utilize wedge wire.

Pleated (Convoluted) Straining Elements:

Particle retention is directly related to the amount of surface area available on the straining element. As straining occurs, the gradual retention of particles can cause a layered build-up on the surface of the straining element. With cylindrical straining elements, this accumulation pattern can quickly clog the outlet side of the strainer causing a significant increase in pressure drop. This is illustrated in Figure 8. To solve this problem, Titan FCI can fabricate pleated straining elements which expand the straining surface area and disperse the particles in a uniform manner. This alleviates the layered build-up and typical loss in pressure. This is illustrated in Figure 9.

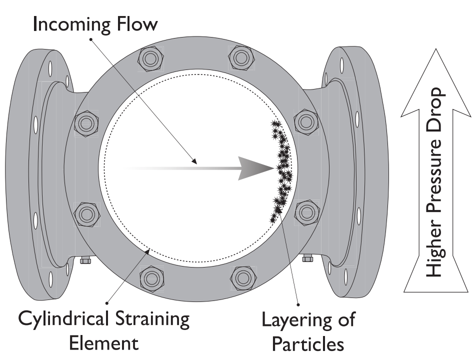


Figure 8: Top View - Basket Strainer - Cylindrical Straining Element

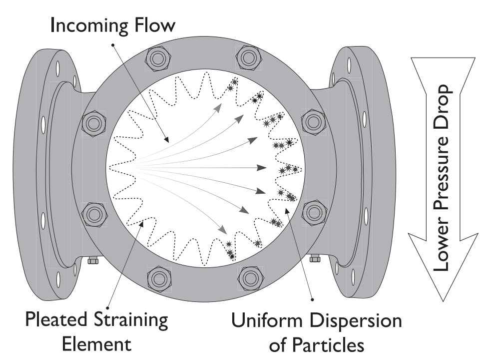


Figure 9: Top View - Basket Strainer - Pleated Straining Element