Automatic Self-cleaning Strainers

Model 2596

Continuous flow, simplified maintenance and worry-free operation

Model 2596 - typical applications

- Automatic self-cleaning strainers are used to strain fresh, brackish or salt intake water for plant services such as cooling, process and fire protection. The strainers allow water to be recycled within the plant, reducing costs.
- Process industry—protect heat exchangers, pumps, valves and spray nozzles.
- Power industry—pump seal protection and cooling water.
- Pulp and paper industry—remove and separate bark and chips for recycling and prevent clogging of nozzles.
- Sewage and water treatment plants—strain secondary effluent prior to discharge and provide clean plant service water.
- Primary metal industry—provide clean water for quenching, descaling and blast furnace cooling.

The Eaton Model 2596 automatic self-cleaning strainer is a motorized strainer designed for the continuous removal of entrained solids from liquid in pipeline systems. This strainer is ideal for applications that demand uninterrupted flow, a major consideration in plant operations.

Eaton automatic self-cleaning strainers are available in the following pipe sizes, 2" to 8" cast iron or stainless steel, 10" to 16" cast ductile iron only and 10" to 60" fabricated carbon steel and stainless steel. Custom designs and exotic materials are available upon request. A wide range of screen designs are offered from $^{1}/_{8}$" perforation to 200 mesh.

They are used for straining cooling water from ponds, lakes or rivers, cooling towers, plant service water, boiler feed water, secondary effluent, irrigation and municipal water intake for equipment protection.

The determining factors are the level of solids content and the ability to handle the backwash discharge flow. They are a worthwhile investment when loading is high or upset conditions occur.

These strainers also provide worry-free operation. Continuous flow is assured, even while the system is being backwashed, providing uninterrupted protection fornozzles, pumps, valves, heat exchangers and other process equipment.

Frequent cleaning and servicing of manual strainers is costly, and if not properly done, serious disruptions to the entire piping system can occur. Eaton automatic self-cleaning strainers will significantly reduce these maintenance costs. They are ideal replacements for either simplex or duplex manual strainers.

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Model 2596 features / benefits

- **Quality construction:** eaton automatic self-cleaning strainers are designed and constructed in accordance with "AD 2000-Merkblätter", DIN EN 13445 or ASME Code. ASME code stamp and approval according to PED 97/23/EU (modules H, H1 or G) are available. Seismic qualification is also available.
- **Idl™ seal:** the unique eaton idl shaft seal prevents troublesome leakage. This special quad seal means that the strainer always stays dry and clean in service with no process media leaking down the sides of the strainer.
- **Ease of maintenance:** unitized modular assembly—the motor, gear reducer, cover and complete internal operating mechanism lift off as a unit, making all components easily accessible. This greatly simplifies maintenance and reduces costs.
- **Low backwash fluid requirements:** only a small portion of system flow is used during backwash due to the efficient hydraulic design.
- **Choice of screen elements:** DuraWedge® perforated or mesh elements.
- **Minimal power consumption:** 1/4 HP drive motor in 2" through 16", 1/3 hp in 18" through 24", 1/2 HP in 30", 1 HP in 36" through 42" and 2 HP in 48" strainers.
- **No bypass of contaminants:** 2" to 8" element caps are epoxy sealed to screen media. O-ring seals on body cover prevent bypass around element. 10" to 60" element caps are epoxy sealed to screen media. A machined cover and body provide metal-to-metal sealing and prevents bypass around the element. For those elements whose retention is below 300 micron (60 mesh) an elastomer seal is provided on top and bottom of the element.
- **Cover seat design:** O-ring permits resealing without time-consuming gasket replacements and adjustment.
- **Manual operation if required:** utilizing extended shaft.

Model 2596 application considerations

For coarse straining applications, such as raw water intakes from lakes, ponds and streams, the convoluted perforated elements will perform well and offer the most economical unit pricing.

On applications in which pre-screening of the fluid has been performed, but finer filtering of the fluids is desired, the sinter-bonded mesh element may be selected.

On applications in which the fluid being strained encounters fibrous materials, the DuraWedge element will minimize the impact of the fibers stapling to the screen.

Debris: Cleaning the straining element is accomplished by using the pressure differential between line pressure and atmosphere. During the cleaning cycle, when the backwash valve is opened to atmosphere, a portion of the strained fluid reverses flow back across the isolated section of element, lifts off the debris and ejects it out of the strainer.

Sticky or greasy debris are more difficult to backwash and may require longer backwash cycle durations. Sand, dirt and pipe scale should backwash easily. The quantity of debris coming into the strainer also can be a problem. Ensure that the volume of the suspended solids does not exceed 200 ppm or 0.02 percent. If the application requires heavier loading consult Eaton.

Backwash requirements: The quantity of fluid required to clean a straining element is dependent upon the type and quantity of debris. Under normal conditions, approximately five percent of the line flow will be used for cleaning of the straining element during the cleaning cycle. To minimize the loss of fluid through the backwash, Eaton recommends to add a manual throttling valve downstream of the automated valve.

Pressure and temperature

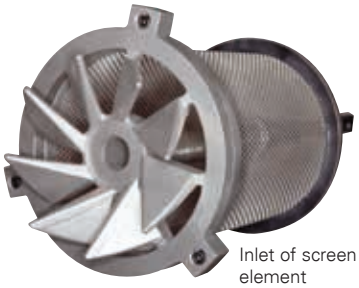
- Cast iron and ductile iron are rated at 10.3 bar @ 65 °C.
- Fabricated units are rated 10.3 bar @ 65 °C. However, other ratings are available, consult Eaton.
- The minimum operating pressure is 1.38 bar.

Cenpeller™ technology

A common problem in many automatic self-cleaning strainers is inefficient backwashing due to debris lodged in the strainer element.

The Model 2596 2" - 8" strainer features a vane plate positioned at the inlet of the strainer element where it contacts the process media before it enters the element. The vane plate causes the incoming liquid to move in a circular motion forcing the debris to lay up against the surface of the strainer element rather than lodging in the element's openings. Lodged debris can negatively impact the differential pressure across the strainer, resulting in a shut down of the strainer and manual cleaning of the element.

Cenpeller Technology helps prevent this situation and delivers easier and more efficient backwashing.



Inlet of screen element

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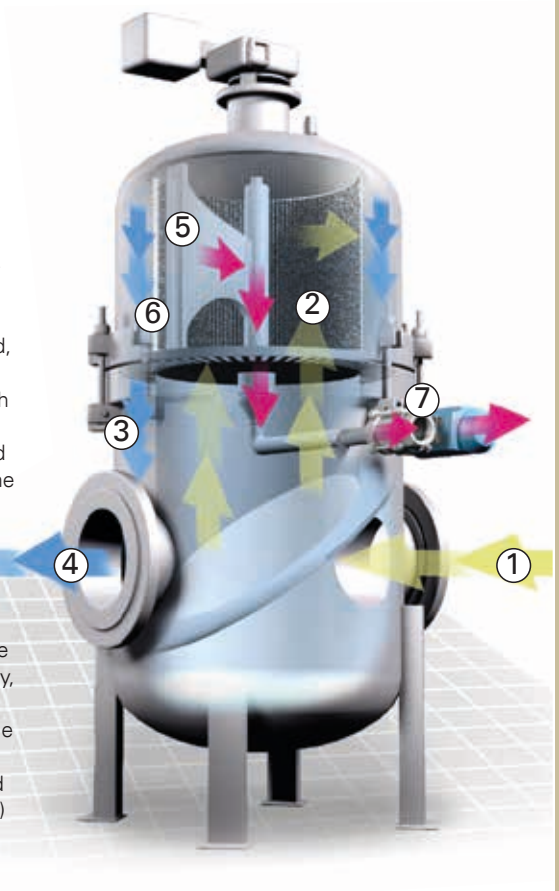
Backwash arm



Model 2596 strainer: how it works

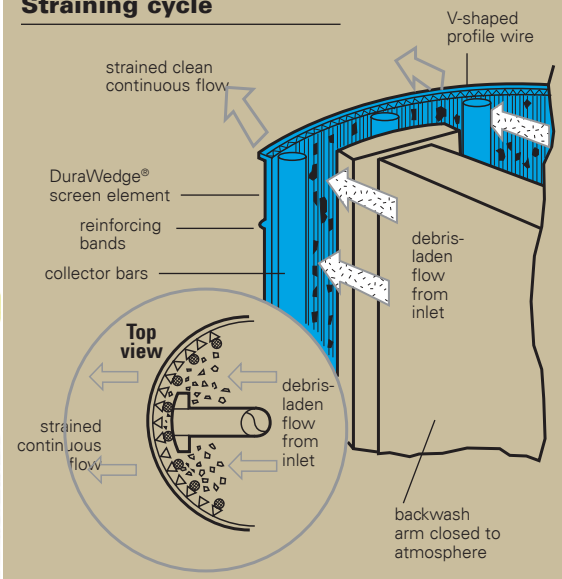
The debris-laden fluid enters the strainer's bottom chamber (1) where the line velocity is reduced. Flow continues upward, passing radially through the sealed screen element (2), which traps debris on the inside of the screen. The flow is uninterrupted and the strained fluid flows to the outer annulus (3) and exits through the outlet nozzle (4).

Backwash cleaning is accomplished by utilizing the pressure differential between line pressure and atmosphere. A high-efficiency, full flow backwash arm (5) extending the entire length of the screen element, rotates slowly inside of the screen and is piped to atmosphere. The port shoe (6) is in proximity to the screen and its opening is equivalent to the "debris collector" sections created by the convolutions and/or vertical collector bars in the element.

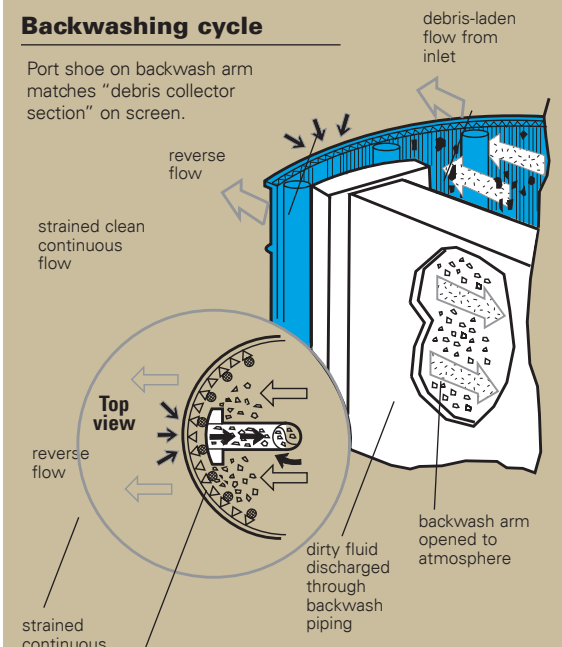
When cleaning is required the automatic backwash valve opens the system to atmosphere, causing a high velocity reverse flow across the isolated section of the screen. Dirt and debris are dislodged from this segment of the screen into the backwash arm and out the strainer through the backwash piping (7). During the backwashing cycle the main flow is uninterrupted and continues to be strained in the normal manner.

Designed to monitor and operate the backwash cleaning system, Eaton automatic control systems are simple to operate, reliable and easily maintained. They are set to clean on differential pressure with a timed backup. The design allows field adjustments to suit the demands of the service conditions, ensuring effective cleaning with a minimum use of backwash fluid. Systems are available in automatic, intermittent or continuous backwashing modes.

Straining cycle



Backwashing cycle



During backwashing, only a small portion of the screen is cleaned at any given time. The majority of the screen continues to screen as normal.

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TECHNICAL INFORMATION
Model 2596 Automatic Self-cleaning Strainers

Sizes 2" to 8" cast construction Model 2596 automatic self-cleaning pipeline strainers are available for six different pipeline sizes. The 4"L size is designed for applications where the combination of flow rate and open area requirements may be too great for a standard 4" size. Flow rates up to 409 m³/h.

Fabricated Model 2596 automatic self-cleaning strainers are available in eight different sizes from 10" to 36", 48" and 60". Custom designs and exotic materials are also available on request, consult Eaton.

Model 2596 automatic self-cleaning strainers in 10" to 16" cast models provide flow rates up to 1,476 m³/h.

Model 2596 flow rate comparison chart

I/O Size & construction	Flow rate* m³/h
2" cast	11.4 - 27.3
3" cast	22.7 - 59.1
4"/4L" cast	38.6 - 102.2
6" cast	84 - 227.1
8" cast	113.6 - 408.8
10" cast	204.4 - 635.9
12" cast	272.5 - 908.5
14" cast	363.4 - 1,135.6
16" cast	454.2 - 1,476.3
10" fabricated	204.4 - 635.9
12" fabricated	272.5 - 908.5
16" fabricated	454.2 - 1,476.3
18" fabricated	567.8 - 1,930.6
20" fabricated	658.7 - 2,316.7
24" fabricated	726.8 - 3,406.9
30" fabricated	1,135.6 - 5,451
36" fabricated	1,771.6 - 7,949.4

*Pressure drop data is approximate and indicates results to be expected with clean water, under normal flows with standard screens and in clean strainer. For DuraWedge and sinter bonded elements, consult Eaton.

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Model 2596 Automatic Self-cleaning Strainers

Control systems & elements

Eaton's Automatic Control Systems are specifically designed to monitor and control the backwash system of automatic self-cleaning strainers. They are both reliable and easy to use. They make it possible to make adjustments that take operating conditions into account and guarantee effective cleaning with minimal use of backwashing fluid.

Standard control system features

The Eaton Easy 719 Control Unit is housed in a Rittal control box with IP65 protection. The control supply voltage is 400 V 3 Ph 50 Hz, meaning the motor can be supplied with the same voltage.

Using transformers, the control system can supply three different output voltages for the backwash valve. The available options are 24 V, 110 V and 230 V.

In addition to the standard system described above, other models can be supplied to meet special requirements relating to wiring, control boxes (door locking system) or ATEX, for example.

The Eaton Easy 719 control relay enables fully-automatic operation. In the automatic intermittent mode, rinse intervals and cycle length can be configured via an external display. The backwash valve can also be controlled manually using a push button.

In both automatic mode and manual backwash mode, the backwash arm continuously rotates at a low 2 – 4 RPM

Modes of operation

The automatic intermittent mode can be configured using the Eaton Easy 719 display panel. Adjustable timers control the frequency and duration of backwashing. On-site adjustments are necessary in order to configure this mode to precise usage requirements. Furthermore, differential pressure switches in the inlet and outlet can be configured so that backwashing will be initiated if differential pressure rises above the chosen setting.

Components

Motors

An electric motor and gear box are supplied with the strainer. The standard motor is a three-phase 400 V/50 Hz motor. Additional motors are available upon request.

Differential pressure switch

The control system can optionally be fitted with pressure switches in the filter inlet and outlet. The additionally-activated differential pressure mode compensates for sudden high dirt loading by overriding the time cycle initially set and initiating backwashing before the end of the cycle. This secondary protective function prevents element damage.

Backwash valve

The strainers can be equipped with electrically actuated ball valves (24 VAC, 110 VAC or 230 VAC). The construction materials used are suitable for water applications. Other materials, valve types and pneumatic actuation are optional.

Backwash valve sizes

Strainer size	Valve size
2", 3", 4"	1"
6", 8"	1 ½"
10", 12", 14", 16"	2"
18", 20", 24", 30"	3"
36"	6"
48", 60"	8"

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Eaton offers a full range of element choices for automatic strainers. All are manufactured to the toughest industry standards and are designed for long term use in even the most demanding applications.

DuraWedge® element

The nonclogging and rugged DuraWedge element is made of stainless steel, formed with precision V-shaped profile wire. Available only from Eaton.

Features

- Two point contact straining from the "smooth" side prevents plugging or packing of debris and particles.
- Effective dislodging of dirt, debris and fibers from the element during backwash. This is accomplished by the increased velocity of the reverse flow (during backwash) from the "open side".
- Fiber stapling is reduced because of smooth surfaces and the design contour of the profile wire.
- Vertical collector bars form spaces to accumulate debris and dirt, preventing snow plowing of materials by the rotating backwash arm and port shoe.
- No bypass. Elements are sealed.
- Fully-welded design with circumferential reinforcing bands provides structural integrity.

DuraWedge element selection

Strainer size	Standard openings
2", 3", 4", 6", 8"	1/16", 1/32", 0.015"
10", 12", 14", 16"	1/8", 1/16", 1/32", 0.015", 0.009"
18", 20", 24"	3/16", 1/8", 1/16", 1/32", 0.015", 0.009"

Convoluted element

This is a sturdy, economical stainless steel element for general service use. It is ideal in applications where leaves, twigs and large amounts of miscellaneous debris are encountered. The generous spaces created by the convolutions provide an area for the debris to collect. "Packing" does not occur due to the gradual contoured shape of the convolutions. During backwashing the debris is easily dislodged and carried away through the backwash arm and out of the strainer.

Features

- Circumferential reinforcing bands for added resistance to pressure and flexing ensures long service life.
- Designed for easy removal and cleaning.
- Convoluted sections are individually isolated by the port shoe during backwash for increased cleaning efficiency.
- No snow plowing. Convoluted profile provides collection spaces for debris.
- Extended area design offered only by Eaton.
- No bypass.
- Sinter bonded mesh available - An Eaton exclusive.

Convoluted element selection

Strainer size	Standard openings
Convoluted perforated element	
2", 3", 4", 6", 8"	1/8", 1/16", 1/32"
10", 12", 14", 16"	1/8", 1/16", 1/32"
18", 20", 24"	5/32", 1/8", 1/16"
Convoluted mesh element	
All sizes	20 mesh (0.015") to 200 mesh (0.003")

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TECHNICAL INFORMATION
Model 2596 Automatic Self-cleaning Strainers

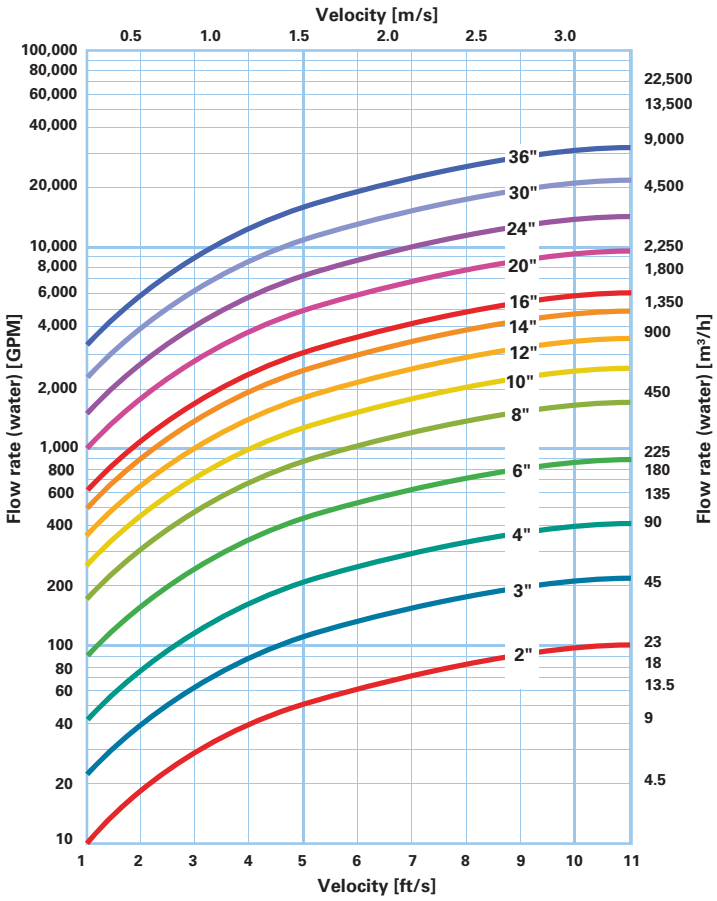
Basic sizing guidelines

1. Select the correct screen and opening size, do not make smaller than necessary.
2. The quantity, type and nature of debris to be removed are considered.
3. The strainer meets the design pressure and temperature requirements of the pipeline.
4. Backwash line should discharge to atmosphere in close proximity to the strainer.

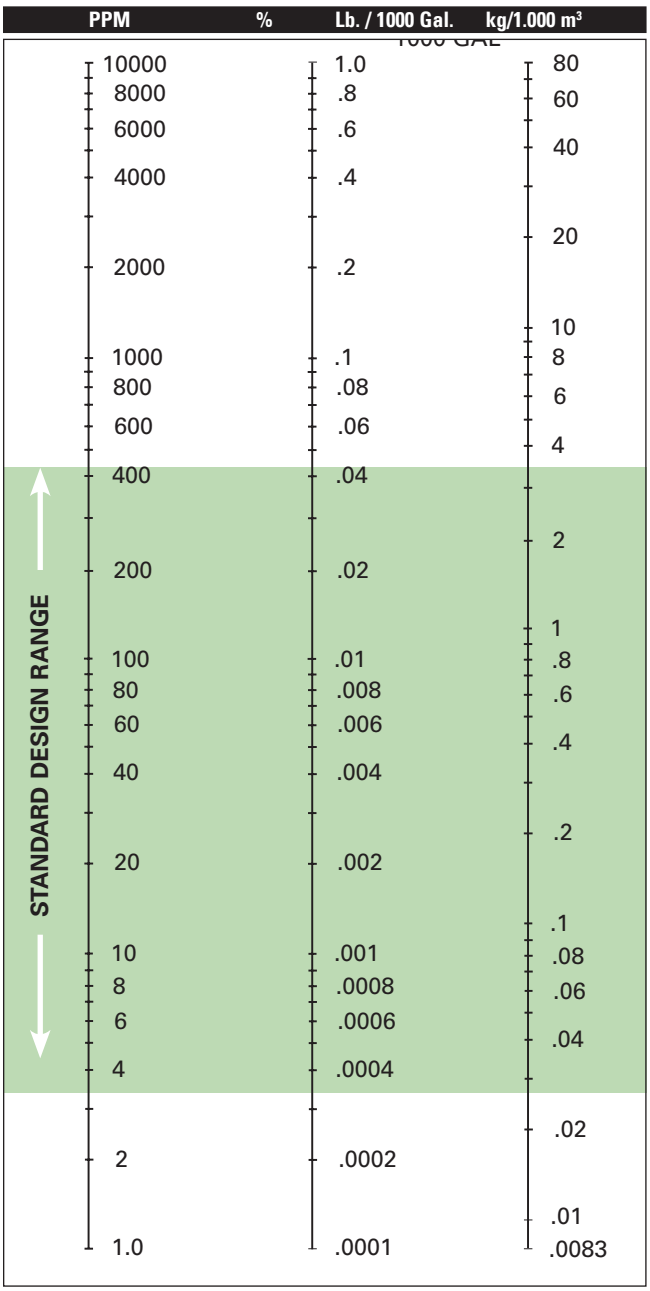
Standard design parameters

1. Self-cleaning strainers have a design flow range where the unit will best perform its two main functions, straining and self-cleaning.
2. Inlet flow velocity to the strainer should be in the 1.83 to 3.05 m/s range. There may be applications where the operating flow will fall outside the normal design range. When this occurs, please contact Eaton for recommendations.
3. Minimum operating pressure is 1.38 bar for standard units. Consult Eaton for equipment options when the system pressure is less than 1.38 bar.
4. Suspended solids should not exceed 200 ppm or 0.02% of volume (see below). For heavier loadings consult Eaton.

Strainer sizing chart



Suspended solids sizing chart and conversion table



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Volume conversion factors

To convert from one unit to another, locate the starting unit in the left column. Multiply by factor horizontally to the right under desired unit.

To obtain: multiply by:	U.S. gallon	Imperial gallon	U.S. pint	U.S.Pound water	U.S. Cubic foot	U.S. Cubic inch	Liter	Cubic meter
U.S. Gallon	1	0.833	8.0	8.337	0.13368	231.0	3.78533	0.003785
Imperial Gallon	1.2009	1	9.60752	10.0	0.16054	277.42	4.54596	0.004546
U.S. Pint	0.125	0.1041	1	1.042	0.01671	28.875	0.473168	0.000473
U.S. Pound Water	0.11995	0.1	0.9596	1	0.016035	27.708	0.45405	0.00454
U.S. Cubic Foot	7.48052	6.22888	59.8442	62.365	1	1728.0	28.31702	0.028317
U.S. Cubic Inch	0.004329	0.00361	0.034632	0.03609	0.0005787	1	0.016387	0.0000164
Liter	0.2641779	0.2199756	2.113423	2.202	0.0353154	61.02509	1	0.001000
Cubic Meter	264.170	219.969	2113.34	2202	35.31446	61023.38	999.972	1

Pressure conversion factor

To convert from one unit to another, locate the starting unit in the left column. Multiply by factor horizontally to the right under desired unit.

To obtain: multiply by:	Pound sq. in.	Pound sq. ft.	Atmosphere	Kilogram sq. cm.	Inch water	Foot water	Inch mercury	mm mercury	Bar
Pounds/Sq. In	1	144.0	0.068046	0.070307	27.7276	2.3106	2.0360	51.7150	0.06895
Pounds/Sq. Ft.	0.0069545	1	0.000473	0.000488	0.1926	0.01605	0.014139	0.35913	0.000479
Atmosphere	14.696	2116.22	1	1.0332	407.484	33.9570	29.921	760.0	1.01325
Kilogram/Sq. Cm.	14.2233	2048.16	0.96784	1	394.27	32.864	28.959	735.558	0.9807
Inch Water	0.03607	5.194	0.002454	0.00254	1	0.08333	0.0734	1.865	0.00249
Foot Water	0.43278	62.3205	0.029449	0.03043	12.0	1	0.8811	22.381	0.02984
Inch Mercury	0.49115	70.726	0.033421	0.03453	13.617	1.1349	1	25.40	0.03386
mm Mercury	0.019337	2.7845	0.0013158	0.0013595	0.5361	0.04468	0.03937	1	0.001333
Bar	14.5038	2088.55	0.98692	1.0197	33.51	402.1	29.53	750.0	1

Strainer basket opening equivalents

Mesh	Inches	Millimeters	Microns
200	0.0027	0.0686	68
150	0.0041	0.1041	104
100	0.0065	0.1651	165
80	0.007	0.1778	177
60	0.009	0.2286	228
40	0.015	0.8636	380
20	0.034	0.8636	862

Tighter retentions available, consult Eaton.

Strainer basket opening equivalents

Perf	Inches	Millimeters	Microns
1/32	0.033	0.838	838
3/64	0.045	1.143	1143
1/16	0.070	1.778	1776
3/32	0.094	2.387	2387
1/8	0.125	3.175	3175
5/32	0.150	3.810	3810
3/16	0.1875	4.762	4762
1/4	0.250	6.350	6350
3/8	0.375	9.525	9525
1/2	0.500	12.700	12,700

Flow velocity conversion factors

$$\text{Velocity in ft/s} = \frac{\text{GPM X } 0.4085}{\text{ID}^2 \text{ inches}}$$

Flow conversion factors

m^3/h	=	3.671 I.G.M.
I.G.P.M.	=	41.14 Barrels/Day
T.P.H.	=	3.74 I.G.M.
I.G.P.M.	=	1.2 U.S. G.P.M.
I.G.P.M.	=	4.54 l/min
l/min	=	0.22 I.G.P.M.
U.S. G.P.M	=	0.833 I.G.P.M.
Barrel	=	35 Imp. Gallons
Barrel	=	42 U.S. Gallons

Viscosity equivalents

SSU (Saybolt seconds universal)	Centipoise	Engler degrees 20 °C	Redwood standard
30	1	–	–
50	5	2	44
100	20	3.5	88
200	40	16	175
300	65	30	263
400	85	43	350
500	105	57	440
600	130	72	525
700	150	90	615
800	175	115	700
900	195	132	790
1000	210	150	880
2000	425	350	1750
3000	625	540	2600
4000	860	740	3500
5000	1050	930	4550
6000	1300	1120	5250
7000	1500	1320	6150
8000	1700	1510	7300
9000	1920	–	–
10,000	2150	–	–

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