Precaution

Specifications may be revised without notice, for the purpose of product improvement. If you are subject to legislation, please note that flammable materials are included. Do not use these filters at locations where condensation occurs or where water is in the environment. Please contact our representatives for specific designs and uses.

NIPPON PURETEC CO., LTD.

2-1-17,Iwamoto-Cho,Chiyoda-ku,Tokyo JAPAN 〒101-0032
Phone 81-3-3862-4768 Fax 81-3-3862-4720

http://www.puretec.co.jp

Version 1108

PureLiteFilter

PF/PY series

NIPPON PURETEC CO., LTD.

Filter Design Manual

"PureLite® " is pellet-type high performance dry adsorbent and it requires appropriate filter design to draw its full performance.

PureLite is suitable for low concentration gas treatment that is difficult with wet type and is used widely in various fields.

Chemical adsorbent design must fulfill a wide range of necessities, such as understanding of type and concentration, etc. of gas, and design of secondary concentration and lifetime, and there may be a lot of anxiety in designing because it is difficult to determine type, amount of use and usage in a uniform manner.

In case of remodeling after operation as backward incidence, it requires rather more cost and effort compared to the initial design. When designing chemical adsorbent, contact us for documents of this catalog and details in advance with full consideration in order to obtain a good result.

We, the company with abundant experiences and performances, also provide wide support including selection of chemical adsorbent, design and production of filters and overall air purification system, precision gas analysis (measurement certificate issuable) that is considered important, and thorough backup such as future maintenance, etc.

Design Procedure

①. Understanding of environment for treatment

Understand name, concentration, temperature, humidity, air volume, etc. of target air and gas for treatment.
If unknown, consider alternative plan, or contact us.

②. Planning of system overview

Set or assume concentration and life time after treatment.
Plan treatment system overview.
(Separately examine wet type, flammable/catalytic oxidizer, etc.)

③. Selection of adsorbent

Select one or several types of optimal chemical adsorbents and also set SV value (p.4-5).

④. Filter design

Design optimal filter system and volume.
In a special case, customized model is applied.

⑤. Design of filter peripherals

Design peripheral devices such as demister, pre/afterfilter, intermediate/ high performance filter and fan.

⑥. Confirmation of operation and effect

If necessary, make an arrangement in the design so that effect can be confirmed in gas analysis, etc. for performance evaluation.
Track the effect in identifying the operation status.

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For Planning

■SV value

Use SV value (Space Velocity) as a scale to assume the secondary concentration and adsorbent lifetime, by which the following matters are explained.
SV value is represented in fraction of volume of adsorbent (m^3) and treatment air volume that passes in an hour, which are indicated with a unit of (Hr^{-1}) or (1/Hr)

$$\text{SV value } (Hr^{-1}) = \frac{\text{Passing air volume } (m^3/Hr)}{\text{Adsorbent volume } (m^3)}$$

The smaller this value is, the longer contact time becomes, the higher the efficiency becomes, and the longer the lifetime becomes.
Treatment ability varies depending on the grade of adsorbent and usage, therefore, that SV value is considered and set individually by experiment and experience, etc.

■Secondary concentration

Unlike air filter, for chemical adsorbent, there is the secondary concentration that can be predicted from set SV value instead of removal efficiency. Regardless of primary concentration, the secondary concentration tends to become nearly constant by set SV value.
This is the property of chemical adsorbent; by lengthening contact time, chemical reaction and media reaction proceed, and removal performance improves. In other words, when SV value is set smaller, the secondary concentration becomes lower, of which level shows a certain correlation with set SV value. However, attention needs to be paid because the ability (secondary concentration level) reduces in a curve when its lifetime comes close to end.
If required secondary concentration has been determined, SV value is conversely set from such value.

■Removal efficiency

Chemical adsorbent (excluding physical adsorption type), since the secondary concentration becomes nearly constant by SV value, seems highly efficient if inlet concentration is high, and the efficiency seems low when inlet concentration is low; removal efficiency depends on the primary concentration rather than the ability.
Furthermore, gas that passes does not necessarily include only target gas, but it also includes unspecified materials that degrade adsorbent, and adsorbent with chemical reaction changes its performance depending on the operation environment such as temperature and humidity, etc.
Therefore, it is inappropriate to discuss removal efficiency like air filter, and removal efficiency is generally not guaranteed.

■Lifetime

Chemical adsorbent degrades (active ingredient reduces by reaction) by use.
Gas that passes is not only set gas, and adsorbent is exhausted by increase of unknown gas and inlet concentration, and short lifetime is assumed, which makes estimation difficult. The performance also naturally declines and the secondary concentration level becomes high when it comes to the end of lifetime.
Generally, it is judged by one of the followings;

①. Tracking measurement of remaining of active ingredient in adsorbent in use
②. Presumption from change of removal performance of the actual machine
③. Comparison of performances between new and old adsorbents by column test
④. Calculation from virtual operation with only set gas

■Pressure loss

Chemical adsorbent adsorbs gaseous material to base material and fix it by chemical reaction. Thus, its pressure loss does not increase after adsorbing gas like air filter under circumstance where normal waste and dust do not attach such as indoor.
Therefore, differential manometer used for air filter is not necessary, but if equipped, it can help judge clogging of adsorbent by dust.
If dust attaches, surface of adsorbent clogs up and reduces its performance. Make sure to place prefilter, etc. on the upper stream side when inletting outer air, and especially for long lifetime design, also place intermediate performance filter, etc. to completely remove dust.

Indexes of Values

Purpose of use	Reference SV value
Clean room of semiconductors and the related (outer air/ circulation treatment)	3,000～20,000
Other clean room (outer air/ circulation treatment)	5,000～30,000
Museums (acid/ alkali measures)	20,000～60,000
Computer protection in factories, etc. (air pollution)	10,000～60,000
Living spaces in offices/ schools, etc. (air pollution)	10,000～60,000
Deodorization in restaurant kitchens/ hospitals, etc.	5,000～30,000
Malodorous substance removal in laboratories/ animal houses, etc.	5,000～20,000
Malodorous substance removal in manufacturing plants	500～20,000
Malodorous substance removal in sewage plants	1,000～10,000

PureLiteFilter

Specific filter method

It is an air-conditioning built-in type (PF series) or duct connection type (PY series); maintenance can be done by replacing with a cassette-type specific filter which is filled up with PureLite.
Replacement of used adsorbent is done on-site or at the plant, but this method is the most popular for it requires only short suspension time and makes on-site operation easy by preparing spare filter and refilling at the plant.
Make combination depending on set SV value and devices, etc.

Features

PF series (see p.6-7)			PY series (see p.8-9)
Built in chamber like air conditioner, etc.	←	Built-in type	→ Chamber not needed; direct duct connection
Extensible in several dozens of chambers	←	Extensibility	→ Up to several units directly combinable
	←	Available for multiple path	→ Several units combinable in series
Installed in series in chamber	←	Filter replacement	→ Direct replacement from door on the side of unit
Easy to add with standard rail	←	Addition of pre	→ Easy to add with prepared space
Built in chamber depending on purpose	←	Addition of intermediate performance	→ Connected in series with optional unit of the same size as unit

Filling tank method

Compared to specific filter method, it is suitable for large facilities, low SV value facilities, or laboratories. High efficiency can be achieved with method to directly fill in bulk and exhaust adsorbent to the filling tank installed in the chamber (unit) on site.

It can be used not only for SS and SUS, but it can be used also for resin-made such as FRP/ PVC, etc. and special metal.

→ It is a special design. Contact us for details.
We also design size, type and pressure loss.

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Major Grades of Adsorbents

Grade	Appearance	Size	Bulk specific gravity	Major target gas	Package unit
A2	White; Cylindrical	φ3×(10±5)	0.75±0.05	Hydrochloric acid, sulfuric acid, nitric acid, and Hydrogen fluoride	15kg/box
A3H	Black; Fractured	4×8 Sphere	0.45±0.05	Hydrogen sulfide, acetic acid,organic acid, sulfuric acid	12kg/box
E2	Red purple; Cylindrical	φ3×(10±5)	0.50±0.05	Hydrogen sulfide, Sulfur dioxide, mercaptan, ethylene, and other complex odors	10kg/box
E3	Red purple; Cylindrical	φ3×(10±5)	0.65±0.05		15kg/box
BE3	Red purple; Cylindrical	φ3×(10±5)	0.65±0.05		15kg/box
E5	Black; Fractured	4×8 Sphere	0.53±0.05		12kg/box
E5H	Black; Fractured	4×8 Sphere	0.40±0.05		12kg/box
E30	Red purple; Spherical	φ4～φ6 Mesh	0.75±0.05	Formaldehyde, mercury	20kg/box
G	Black; Fractured	4×8 Sphere	0.51±0.05	Formaldehyde	15kg/box
GAR	Black; Fractured	4×8 Sphere	0.50±0.05	Formaldehyde, Acetaldehyde	15kg/box
F	White; Cylindrical	φ3×(10±5)	0.95±0.05	Alkaline gas (Ammonia, amines)	15kg/box
F4	Black; Fractured	4×8 Sphere	0.72±0.05		15kg/box
F4H	Black; Fractured	4×8 Sphere	0.58±0.05		15kg/box
K	Black; Fractured	4×8 Sphere	0.48±0.05	Organic solvent, ozone, organic acid, Nitrogen dioxide	15kg/bag
KH	Black; Fractured	4×8 Sphere	0.37±0.05		12kg/bag
02	Black; Cylindrical	φ3×(10±5)	0.40±0.05	Ozone, Chlorine, Nitrogen dioxide	10kg/box

Precautions

- Adsorbent is weak in water. Be sure to prevent rain infiltration and internal condensation.
- It is rather heavy compared to air filter. Care is needed for operation weight. There is a possibility that the lower filters of multiple-piling type may be deformed by weight of the upper weight. Reinforcement, etc. is required in case of exceeding 3 layers. Contact us for details.
- Specific filters are very heavy. Be sure not to drop when handling.
- Specific filters are usually delivered separately from the unit. To avoid deterioration, insert right before test run.
- Some dust is generated in the lower stream of adsorbent during test run (short time). If bad influence is expected, take measures by building in afterfilter and curing filter makeshift, etc.

● Be sure to thoroughly read precautions in PureLite catalog for handling.

PF Series Models

PF400 FN—P6 (F4)

Products marked with ☐ are available.

Name

400	: Standard type	(specific filter depth 400mm)
230	: Small volume type	(specific filter depth 230mm)
590	: Double volume type	(specific filter depth 590mm)

Material

	: SS standard	(epoxy coating on SPCC (black))
S	: SUS304	(no coating)
M	: Special material	(handled individually)

Inlet

F	: Full size	(Inlet size 610(W)×610(H))
H	: Horizontal half size	(Inlet size 610(W)×305(H))
T	: Vertical half size	(Inlet size 305(W)×610(H))

Fixing hall

	: No hall
N	: Install fixation hall on unit (our standard plan)
V	: Install fixation hall on unit (individually handled)

Options

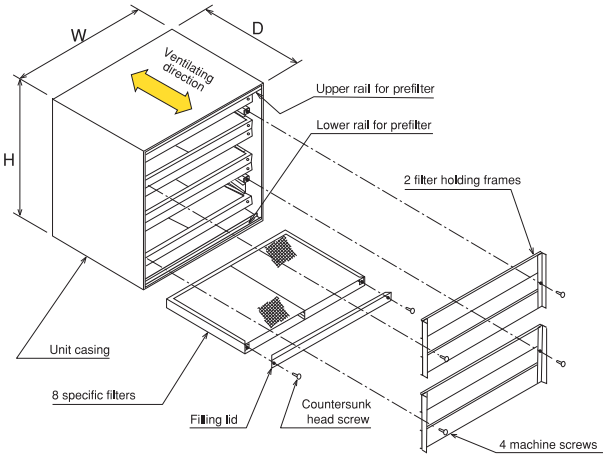
Pre/after-filter

P6	: Washable nonwoven fabric PS/600	(with t20 aluminum frame)
P4	: Washable nonwoven fabric PS/400	(with t20 aluminum frame)

Agent filling

( ): Write adsorbent name in parenthesis in case of delivery after filling

PF Series internal drawing



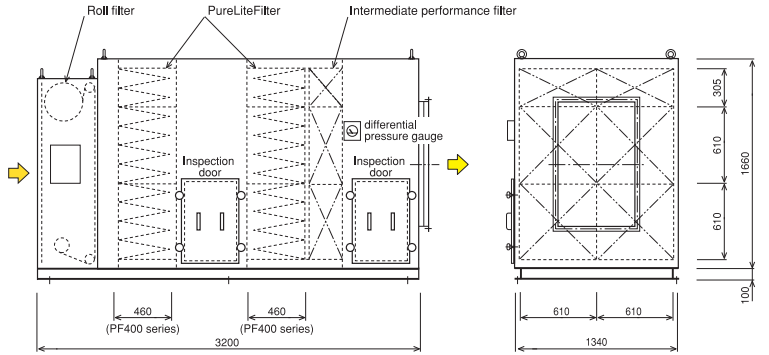
A sample of SS

(Numbers in blue are reference values for design. Not standard values.)

Form of combination			Unit only (casing)		Built-in specific filter		Approximated total weight at operation after filling
Product No.	Outer size (W×H×D)	Guide for filling volume	Product No.	Approximation of weight	Product No.	Number of filters (weight before filling)	
PF400FN	610×610×460	57ℓ	F-400FN	21kg	P400	8 (22kg)	F : 90kg E3: 82kg K : 73kg
PF400HN	610×305×460	28.5ℓ	F-400HN	14kg		4 (11kg)	F : 48kg E3: 44kg K : 40kg
PF400TN	305×610×460	28ℓ	F-400TN	16kg	T400	8 (12kg)	F : 52kg E3: 47kg K : 43kg
PF230FN	610×610×290	34ℓ	F-230FN	15kg	P230	8 (16kg)	F : 58kg E3: 53kg K : 48kg
PF230HN	610×305×290	17ℓ	F-230HN	11kg		4 (8kg)	F : 32kg E3: 30kg K : 27kg
PF230TN	305×610×290	16.5ℓ	F-230TN	13kg	T230	8 (9kg)	F : 35kg E3: 33kg K : 30kg
PF590FN	610×610×660	115ℓ	F-590FN	29kg	P590	8 (36kg)	F : 162kg E3: 145kg K : 128kg
PF590HN	610×305×660	57.5ℓ	F-590HN	20kg		4 (18kg)	F : 86kg E3: 78kg K : 69kg
PF590TN	305×610×660	56.5ℓ	F-590TN	24kg	T590	8 (20kg)	F : 91kg E3: 83kg K : 74kg
PF600FN	610×610×660	90ℓ	F-600FN	29.5kg	P600	12 (48kg)	F : 137kg E3: 150kg K : 123kg
PF600HN	610×305×660	45ℓ	F-600HN	17.5kg		6 (24kg)	F : 78kg E3: 71kg K : 64kg
PF600TN	305×610×660	44.5ℓ	F-600TN	24kg	T600	12 (24kg)	F : 84kg E3: 78kg K : 71kg

We also provide lower pressure loss type. Contact us for availability and delivery time, and models not listed above.

PF series usage sample



PY Series Models

PY400 F — P6(E302)

Products marked with □ are available.

Name

400	: Standard type	(specific filter depth 400mm)
230	: Small volume type	(specific filter depth 230mm)
590	: Double volume type	(specific filter depth 590mm)

Material

	: SS standard	(epoxy coating on SPCC (gray))
S	: SUS304	(no coating)
M	: Special material	(handled individually)

Inlet

F	: Full (standard) size	(Inlet size605 (W)×650 (H))
H	: Horizontal half size	(Inlet size605 (W)×350 (H))
T	: Vertical half size	(Inlet size300 (W)×650 (H))

Options

Flow direction

Pre/ afterfilter

	: Standard (no designation)
A	: See the chart on right if channel base accompanies.
B	: See the chart on right if channel base accompanies.

※Inspection door as front: see below.

Flow direction	Prefilter used or space prepared	Afterfilter used or space prepared
Left flow	A	B
Right flow	B	A

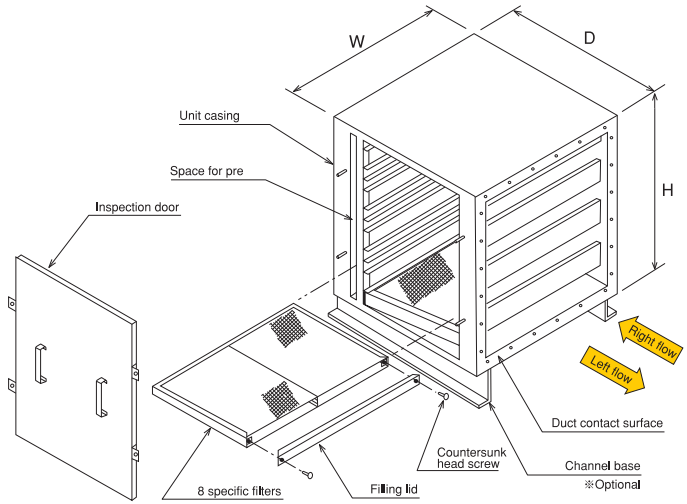
Agent filling

P6	: Washable nonwoven fabric PS/600	(with t20 aluminum frame)
P4	: Washable nonwoven fabric PS/400	(with t20 aluminum frame)

( ): Write adsorbent name in parenthesis in case of delivery after filling

※Other options are individually handled.

PY Series internal drawing



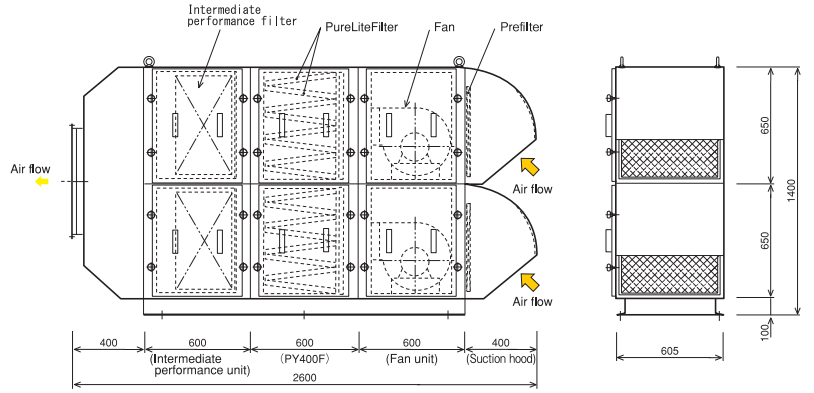
A sample of SS

(Numbers in blue are reference values for design. Not standard values.)

Form of combination			Unit only (casing)		Built-in specific filter		Approximated total weight at operation after filling
Product No.	Outer size (W×H×D)	Guide for filling volume	Product No.	Approximation of weight	Product No.	Number of filters (weight before filling)	
PY400F	605×650×600	57ℓ	Y-400F	34kg	P400	8 (22kg)	F : 103kg E3: 95kg K : 86kg
PY400H	605×350×600	28.5ℓ	Y-400H	26kg		4 (11kg)	F : 60kg E3: 56kg K : 52kg
PY400T	300×650×600	28ℓ	Y-400T	28kg	T400	8 (12kg)	F : 64kg E3: 59kg K : 55kg
PY230F	605×650×430	34ℓ	Y-230F	29kg	P230	8 (16kg)	F : 72kg E3: 67kg K : 62kg
PY230H	605×350×430	17ℓ	Y-230H	22kg		4 (8kg)	F : 43kg E3: 41kg K : 38kg
PY230T	300×650×430	16.5ℓ	Y-230T	24kg	T230	8 (9kg)	F : 46kg E3: 44kg K : 41kg
PY590F	605×650×790	115ℓ	Y-590F	50kg	P590	8 (36kg)	F : 183kg E3:166kg K :149kg
PY590H	605×350×790	57.5ℓ	Y-590H	38kg		4 (18kg)	F : 104kg E3: 96kg K : 87kg
PY590T	300×650×790	56.5ℓ	Y-590T	42kg	T590	8 (20kg)	F : 109kg E3:101kg K : 92kg

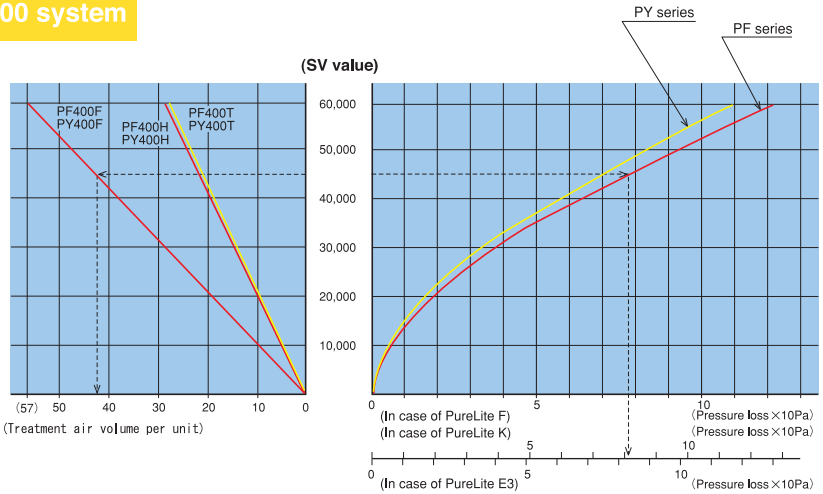
As other options, intermediate performance filter unit, phase flange base door hinge for PY series are available.
Contact us for availability and delivery time, and models not listed above.

PY series usage sample



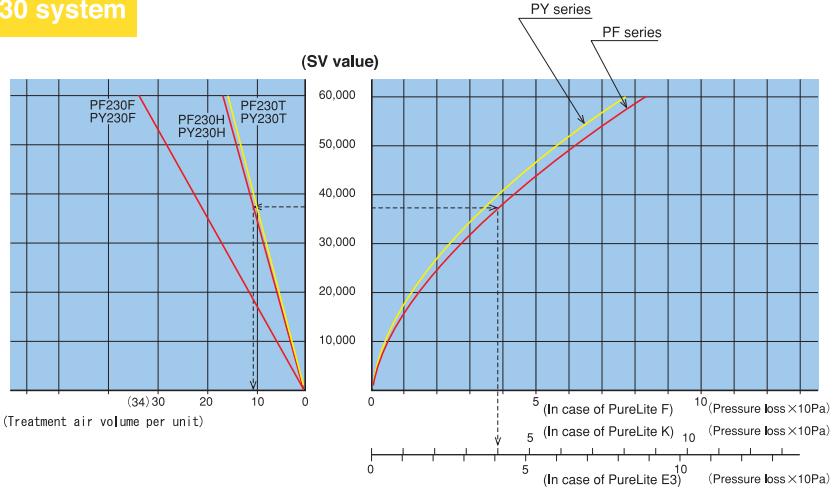
PF/PY Series SV Value (Hr^{-1}) and Pressure Loss Chart

400 system



Example: When PF400FN is used at SV=45,000; approximately 42CMM per unit and pressure loss is approximately 78Pa.

230 system



Example: When PF230HN is used at SV=37,000; approximately 11CMM per unit and pressure loss is approximately 40Pa

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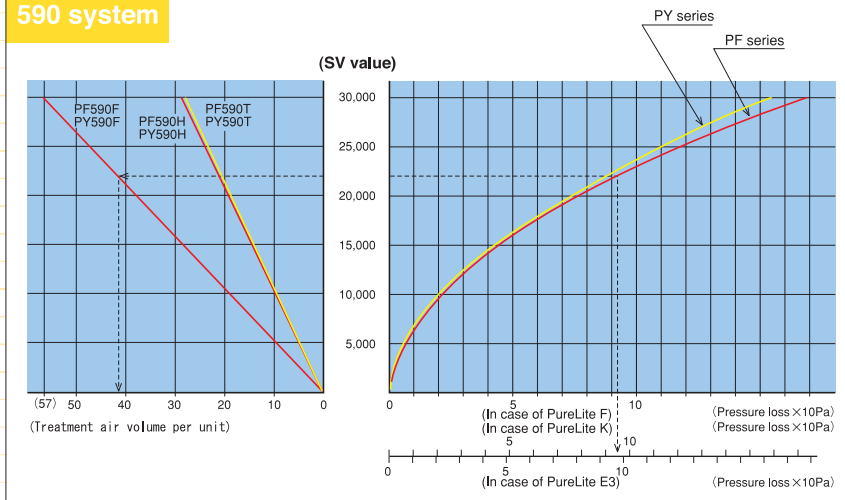
590 system

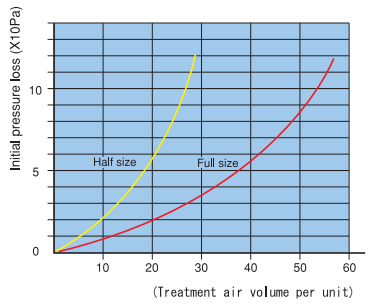


Example: When PF590FN is used at SV=22,000; approximately 42CMM per unit and pressure loss is approximately 98Pa.

■ Prefilter pressure loss chart

Prefilter initial pressure loss
(If prefilter accompanies, add to the previously mentioned PureLiteFilter pressure loss.)
Half size: horizontal half and vertical half are the same.

□□□□– In case of-P6 (PS/600)



□□□□– In case of-P4 (PS/400)