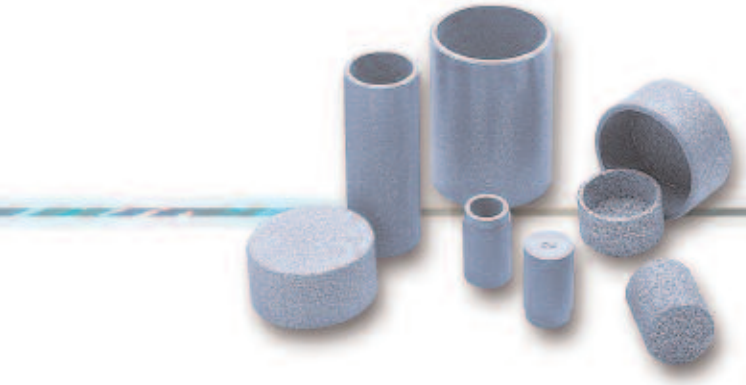
mott corporation
Porous Metal Products



Porous metal solutions.

Filtration, flow control, sparging, dispersion and shapes of porous metal.

Absolutely reliable, any way you can imagine.

Mott porous metal media. The high-strength, high-performance choice for permeable designs.

Whether you're flowing gas or liquid, Mott porous metal is the proven, reliable, long-lasting media for efficient particle capture, flow restriction, wicking and gas/liquid contacting. For decades, users of alternative media such as fabric- and polymer-based filters have switched over to Mott for the distinct advantages that Mott porous metal provides:

Long life – In most applications, Mott porous metal maintains high filtration efficiency and structural integrity through years of continuous use.

High strength – Mott media is unsurpassed in tensile strength, making it well suited for high differential pressures and flow rates.

Uniform porosity – A strictly controlled sintering process enables Mott to produce uniformly sized and distributed pores, in media grades ranging from 0.1 to 100.

Fully cleanable – Particles may be removed from Mott media using backpulse and other cleaning methods, restoring the media to its original efficiency for repeated performance.

No media migration – "Solid-state diffusion bonding" holds filter media together at the molecular level, making it virtually inseparable, even under the harshest conditions.

	Maximum Temperature	
Material	**Oxidizing Atmosphere**	**Reducing Atmosphere**
316L SS	750°F/399°C	900°F/482°C
Hastelloy® C-276	850°F/454°C	1000°F/538°C
Inconel® 600	1100°F/593°C	1500°F/815°C
Hastelloy® X	1450°F/788°C	1700°F/927°C

High heat tolerance – All-metal construction and welded joints and seams endure high temperatures, even in the midst of oxidizing atmospheres.

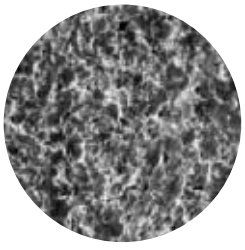
Wide choice of materials – In addition to 316L stainless steel – Mott's standard material of construction – customers may choose from many other metals and alloys to meet special requirements such as greater temperature and corrosion resistance:

- Stainless Steel; 316L, 304L, 310, 347 and 430
- Hastelloy C-276, C-22, X, N, B and B2
- Inconel 600, 625 and 690
- Nickel 200 and Monel® 400 (70 Ni-30 Cu)
- Titanium
- Alloy 20
- Many others – Consult factory

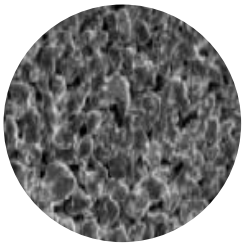
Precise manufacturing helps control a variety of performance characteristics.

Controlling the physical characteristics of Mott media results in still more benefits – controlled performance. By altering shape, porosity, material of construction, and many other factors, Mott can provide complete functional control over a wide range of properties including:

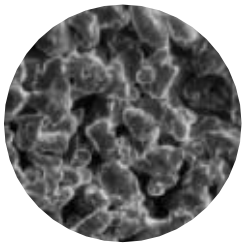
- Mean pore size
- Capillary attraction
- Surface characteristics
- Thermal conductivity
- Density
- Particle size retention
- Mechanical properties
- Permeability



Media Grade 0.2 (x100)

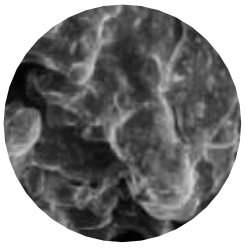


Media Grade 0.5 (x100)



Media Grade 5 (x100)

Media Grade 20 (x100)



Media Grade 100 (x100)

Manufacturing methods for the highest quality and consistency.

Mott porous metal fabrication begins with pregrading the metal powders using precise particle size distributions. Powders are then compressed into desired shapes – a process which reduces or eliminates the need for post-sintering shaping and forming, while providing additional benefits:

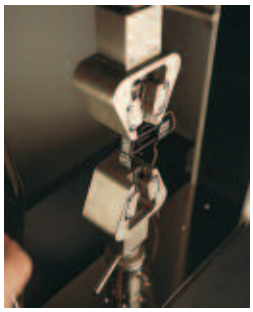
- Precise dimensional control
- More uniform porosity by reducing the number of oversized pores
- Improved permeability and density control
- Higher strength by increasing the number of bonds between adjacent particles

Precompressed metal powders are then sintered in controlled atmosphere furnaces at temperatures approaching the melting point for the specific alloy being used. The controlled atmosphere heating process reduces surface oxide films from powder particles, and promotes the formation of strong bonds between the particles.

From start to finish of the manufacturing cycle, Mott technicians apply stringent control of processing variables such as compacting pressure, sintering time, temperature and atmosphere, resulting in precise control of density, permeability, and pore size. Lots are checked for permeability uniformity, pore size uniformity, carbon content, corrosion resistance, and chemistry. The result is consistent, reproducible quality – available only with Mott porous metal media.

Research and Development.

The Mott R&D Laboratory maintains a complete development and testing facility for the practical evaluation of porous metal. Research and development work involves the constantly evolving filtration technology, and other flow control applications for a broad range of process needs. This capability is an important part of our customer support program, enabling us to prove the operation and cost effectiveness of the products or systems we offer.

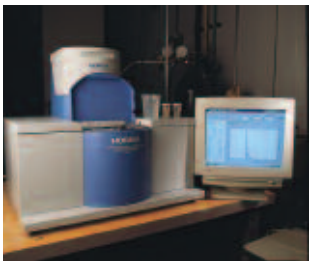


Universal tensile machine.

Scanning electron microscope (SEM).

Our laboratory contains a wide array of analytical equipment to support new product development, customer sample testing and system troubleshooting. Our capabilities are supported by equipment such as:

- Metallographic equipment
- Microhardness tester
- Scanning electron microscope
- Energy dispersive x-ray analyzer
- Image analysis system
- Universal testing system
- Porometers
- Horiba particle size analyzer
- Condensation nucleus counters
- Laser particle counters
- Liquid particle counters
- Particle classifier
- Aerosol monitors
- Bench and pilot scale liquid filtration test equipment with data acquisition and control capability



Particle size analyzer.

Primary design considerations.

All porous products, whatever the material of construction, have specific properties which must be taken into account in design and manufacturing processes. Proper attention to these characteristics will help control costs in manufacturing, while at the same time, produce the best combination of properties and performance.

In order to select the best media for any application, one should be able to provide Mott with the following information:

Primary application considerations

- Desired particle retention
- Pressure drop
- Flow rate
- Cleanliness requirements
- Operating fluid – type, density, viscosity
- Process temperature
- System pressure
- Corrosive effects, if any

Primary media considerations

In some cases, you may already know what type of Mott media is the best choice for your application. Standard products are designated by shape and media grade, but other characteristics may be altered to "fine tune" product performance:

- Mean pore size
- Density
- Pore size distribution

Manufacturing/assembly considerations

OEMs who wish to alter the shape or configurations of Mott products need to be aware of procedural limitations and guidelines to avoid compromising permeability. Listed here are basic considerations.

- ***Forming*** – Mott porous metal media has significant ductility, which allows cold forming within certain limits. For example, Mott standard 316L stainless steel, 1/16"- thick sheets can be roll formed into cylindrical filter elements with an outside diameter as small as 1¼". Smaller diameter tubes may be formed by using thinner sheets.
- ***Machining*** – Conventional machining will close surface pores, making the machined surface impermeable. It is possible, however, to keep surface pores open with electrical discharge machining (EDM) and subsequent cleaning. Mott provides these machining services. Ask our sales professionals for more information.

  If conventional machining is to be applied, Mott recommends using only water-soluble oils as lubricants. The machined components may subsequently be reactivated with a proprietary technique developed by Mott, performed at the factory. Customer-machined media may be returned to have this technique applied.
- ***Brazing*** – Brazing porous metal is extremely difficult. The porous metal tends to act as a wick, so when molten braze is applied, it is soaked up into the pores, filling them and destroying porosity. To avoid this effect, Mott has developed a special brazing technique which will be performed upon request.
- ***Welding*** – Mott sintered porous metal can be readily welded – to other porous and solid metal parts – as long as certain procedures are followed. Approximately 50% of porous metal consists of voids which tend to collapse under the heat of the welding arc. When this happens, additional metal must be added during the welding process to compensate for the reduced volume. This can be accomplished with a filler rod, or can be provided in the weld preparation of the mating solid component.

  Achieving optimal welds requires proper joint design. Our in-house weld shop has the experience and expertise to get the job done right. Contact us directly for more information on our services.

Cleaning considerations

Mott porous metal media can be cleaned for continuous reuse through a variety of techniques. The best method depends on the application – how the media is used, and what types of gases, liquids and particles are present. The following table shows some of the more common cleaning techniques.

Cleaning recommendations may be obtained by contacting Mott or visiting our website, **www.mottcorp.com**.

Application	Recommended cleaning method
Barrier filter (particulate retained on filter surface)	Reverse flush (clean fluid or gas)
Depth-type filter (particulate entrained within pores)	Ultrasonic cleaning (backflush with solvent first if particulate are nonreactive with the media)
Combustible contaminant	Salt bath at elevated temperature (use nitrogen blanket if bath temperature is >750°F)
Barrier and depth contaminant	Oven burning with steam blanket, followed by ultrasonic cleaning

Designs for your application.

Air film rolls/air bearings.

Function: Guides surface-sensitive webs on a cushion of air during transport.

Application Examples: Photographic film; magnetic audio, video or computer tape; pressure-sensitive adhesive tape; metal foils; polyethylene films.

Flow restrictors.

Function: Provides laminar flow and precise control/regulation of gas or liquid flows.

Application Examples: Flow control of liquid drugs; gas mixing into beverages; safety devices on anesthesia machines; flow control in gas chromatographs, laminar flow elements, flow splitters, calibrated leaks.

Breathers/pressure equalizers.

Function: Relieves pressure, allows pressure equalization while excluding contaminants.

Application Examples: Vents, vent covers, tank vents, sound/speaker enclosures, mold vents, rate of rise pressure devices.
Note: Media can be treated to repel water while maintaining permeability.

Instrument filters.

Function: Protects critical instruments by providing maximum purity and optimal flow.

Application Examples: In-line filtration, chromatography solvents, protects HPLC pump inlet check valves from particulate.

Flame arrestors.

Function: Prevents flammable gases from burning back to supply source by quenching/cooling flame.

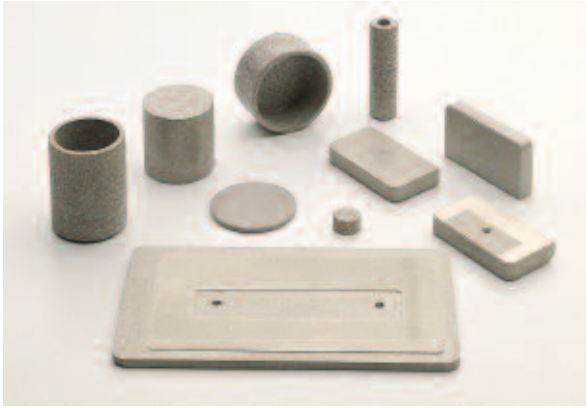
Application Examples: Welding torches, gas cabinets, gas analyzers, electrical enclosures, pressure regulators for flammable gases or oxygen service.

Designs for your application.

Silencers.

Function: Sound dampening/reduction.

Application Examples: Sound attenuation for pneumatic devices.



Wicks.

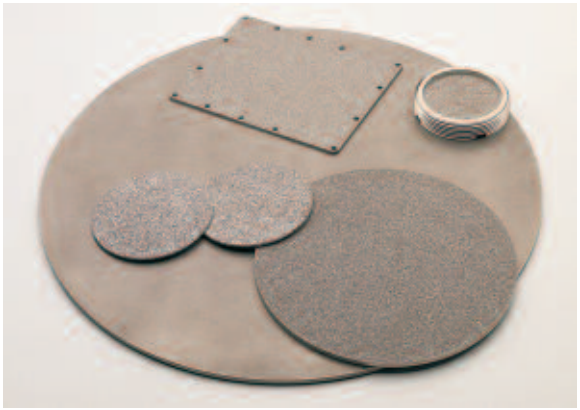
Function: Absorbs liquids for dispersion, removal or vaporization.

Application Examples: Ink adsorption plates, thermal management heat pipes, butane lighters.

Spargers.

Function: Distribution device for gas/liquid interfacing.

Application Examples: Aeration; bulking, carbonation, hydrogenation, oxidation, oxygen stripping ozone delivery.



Fluidizers.

Function: Uniformly disperses gas into particle bed.

Application Examples: Aeration, heat-treating powder hoppers to aid powder flow by preventing bridging.

Polymer filters.

Function: Removes cross-linked and gelled molecules which lead to filament breakage.

Application Examples: Nylon 6 and 6,6 production, polyethylene, rayon.

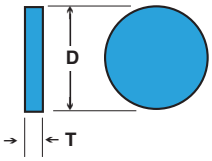
Basic shapes.

Standard shapes of Mott porous metal media offer an expedient, cost-effective means of satisfying application requirements.

NOTE: Tighter tolerances are available for all products shown. Please contact Mott to speak with our Sales Department if you have more exacting requirements.

For more information about these or other products call Mott at **1-800-BUY-MOTT (800-289-6688)**, **1-860-747-6333** or visit our website, **www.mottcorp.com**.

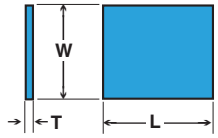
Discs Mott porous 316L SS discs, Series 1000.
Use part desc. 1000-D-T-Media Grade.



Discs	D, in. (standard tolerance)	T, in. (standard tolerance)
Smallest standard size	0.062 (±0.002)	0.039 (±0.005)
Largest standard size	1.000 (±0.008)	0.125 (±0.015)

Also available: discs from 0.020" to 8.375" in diameter.
Larger discs cut from porous metal sheets are also available.

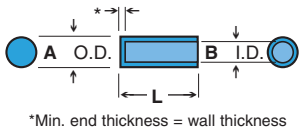
Sheets Mott porous 316L SS sheet, Series 1100.
Use part desc. 1100-W-L-T-Media Grade.



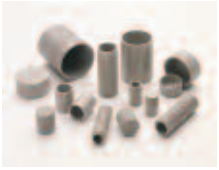
Sheets	W, in. (standard tolerance)	L, in. (standard tolerance)	T, in. (standard tolerance)
Smallest standard size	8.50 (+0.093/-0.062)	10.00 (+0.093/-0.062)	0.039*/0.062* 0.078*/0.093**
Largest standard size	10.00 (+0.093/-0.062)	12.00 (+0.093/-0.062)	0.125 (±0.010)

Other sizes and thicknesses are also available.
** = ± 0.005; ** = +0.015/-0.010*

Cups Mott porous 316L SS cups, Series 1200.
Use part desc. 1200-A-B-L-Media Grade.



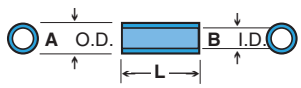
*Min. end thickness = wall thickness



Cups	A, in. (standard tolerance)	B, in. (standard tolerance)	L, in. (standard tolerance)
Smallest standard size	0.125 (±0.005)	0.062 (±0.005)	0.125 (±0.015)
Largest standard size	0.812 (±0.015)	0.641 (±0.010)	1.060 (±0.015)

Also available: cups from 0.078" to 1.57" O.D.

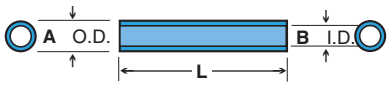
Bushings Mott porous 316L SS bushings, Series 1300.
Use part desc. 1300-A-B-L-Media Grade.



Bushings	A, in. (standard tolerance)	B, in. (standard tolerance)	L, in. (standard tolerance)
Smallest standard size	0.250 (±0.005)	0.125 (±0.005)	1 (±0.015)
Largest standard size	0.375 (±0.005)	0.250 (±0.005)	1 (±0.015)

Also available: bushings from 0.138" to 18" O.D.

Seamless Tubes Mott porous 316L SS seamless tubing, Series 1400.
Use part desc. 1400-A-B-L-Media Grade.



Seamless Tubes	A, in. (standard tolerance)	B, in. (standard tolerance)	L, in. (standard tolerance)*
Smallest standard size	0.250 (+0.012/-0.002)	0.125 (nom.)	6 (+0.125/-0.000)
Largest standard size	1.000 (+0.050/-0.010)	0.750 (nom.)	24 (+0.125/-0.000)

Standard lengths: 6", 12", 18", 24".
Also available: longer tubes and other diameters.
•±0.015 tolerance is also available – consult factory.

Key: D=Diameter, T=Thickness, W=Width, L=Length, A=Outside Diameter, B=Inside Diameter

Permeability – A measured liquid or gas flow for a given pressure drop.

316L SS Rolled Sheet.

The flow curves on these pages are presented as a design aid for application development using Mott porous metal sheet media. The data is not necessarily representative of Mott's pressed parts. The air flow graph has data for all media grades determined under ambient conditions. Flow data for water and higher viscosity liquids are given in the other graphs for our standard media grades.

Liquid Efficiency.

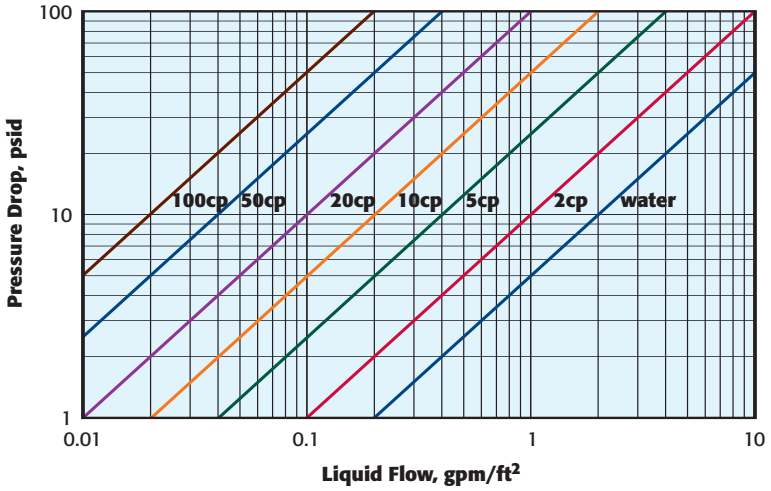
Media Grade	Particle size, µm		
	Initial Collection Efficiency		
	90%	99%	99.9%
0.2	0.5	0.9	1.4
0.5	1	1.7	2.2
1	1.5	2.2	3.3
2	4	5.5	9
5	5	8	13
10	10	16	20
20	20	26	35

Testing performed per ASTM F795
Tested at 1 gpm/ft²
ISO A2 or A3 test dust suspended in water

Air Efficiency.

Media Grade	Particle size, µm		
	Initial Collection Efficiency		
	90%	99%	99.9%
0.2	A	B	0.2
0.5	A	0.25	0.3
1	A	0.35	0.7
2	0.3	0.6	2
5	0.8	2	5
10	4.5	8	13
20	8	12	20

Testing performed per IBR E304
Tested at flux of 6 acfm/ft²
A = Initial efficiency is greater than 90% for all particle sizes
B = Initial efficiency is greater than 99% for all particle sizes



Media Grade: 0.2
Thickness: 0.039 inches

Material Specifications
Bubble Point, in. of Hg: 5.0 - 6.9
Tensile Strength, kpsi: 30.0
Yield Strength, kpsi: 26.0

Permeability Coefficient
Liquid, K_L: 140
Gas, K_G: 1400

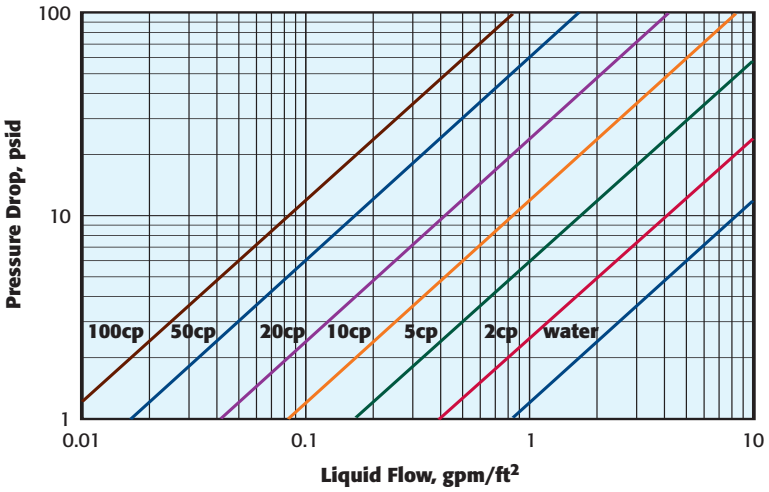
Notes to flow graphs.

1. Differential pressure varies in direct proportion to sheet thickness. Standard sheet thickness varies with media grade.
2. Flow curves are presented in a log-log format; be sure to note the correct numerical values for each log cycle.
3. Flow characteristics given are for porous media only. To determine total pressure drop of a system, combine losses through media, fittings, housing, piping and valves as appropriate.
4. These flow characteristics were derived using 316L SS porous media.
5. These flow characteristics are typical and should be used for general reference only.
6. Tests run at 70°F with water, other curves generated using calculated formulas.

Liquid: Pressure Drop, psid = (K_L)(Flux, gpm/ft²)(Visc, cp)(Thck, in.)
Gas: Pressure Drop, psid = (K_G)(Flux, acfm/ft²)(Visc, cp)(Thck, in.)

Permeability information.

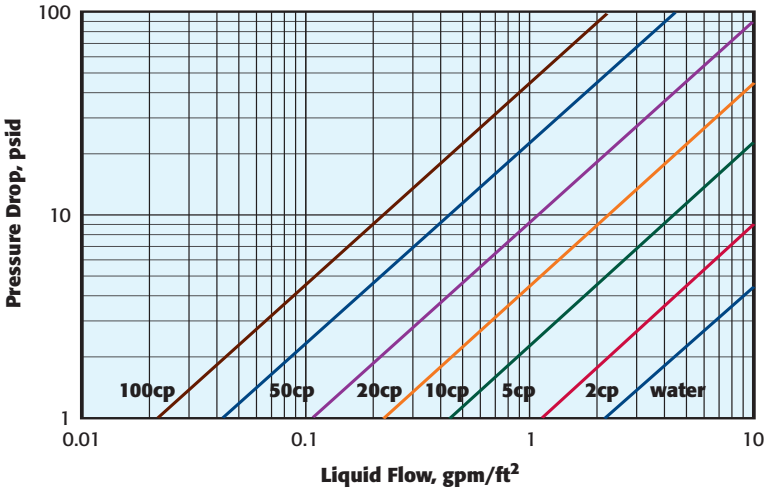
316L SS Rolled Sheet (cont'd).



Media Grade: 0.5
Thickness: 0.047 inches

Material Specifications
Bubble Point, in. of Hg: 3.0 - 3.9
Tensile Strength, kpsi: 23.5
Yield Strength, kpsi: 21.0

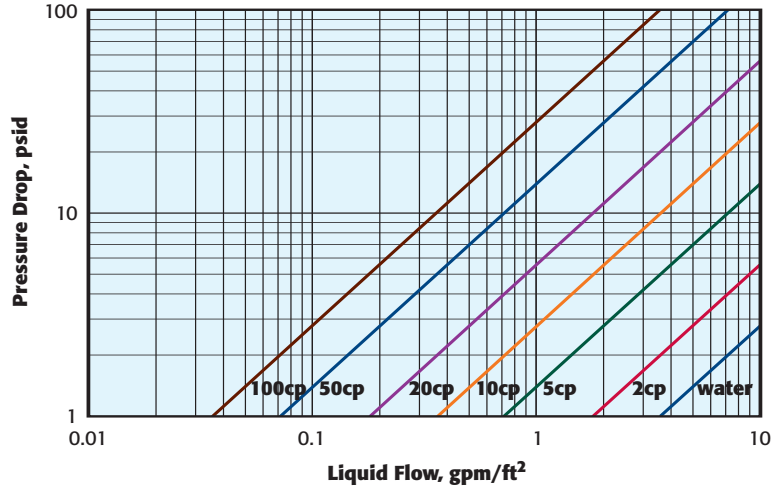
Permeability Coefficient
Liquid, K_L: 30
Gas, K_G: 260



Media Grade: 1
Thickness: 0.047 inches

Material Specifications
Bubble Point, in. of Hg: 2.0 - 2.5
Tensile Strength, kpsi: 20.5
Yield Strength, kpsi: 17.0

Permeability Coefficient
Liquid, K_L: 9
Gas, K_G: 90



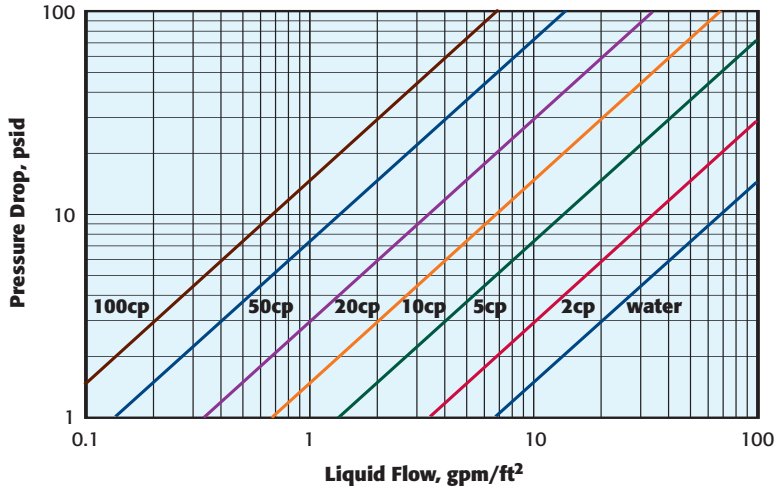
Media Grade: 2
Thickness: 0.062 inches

Material Specifications
Bubble Point, in. of H_2O: 17.0 - 24
Tensile Strength, kpsi: 17.7
Yield Strength, kpsi: 13.2

Permeability Coefficient
Liquid, K_L: 4
Gas, K_G: 25

Permeability information.

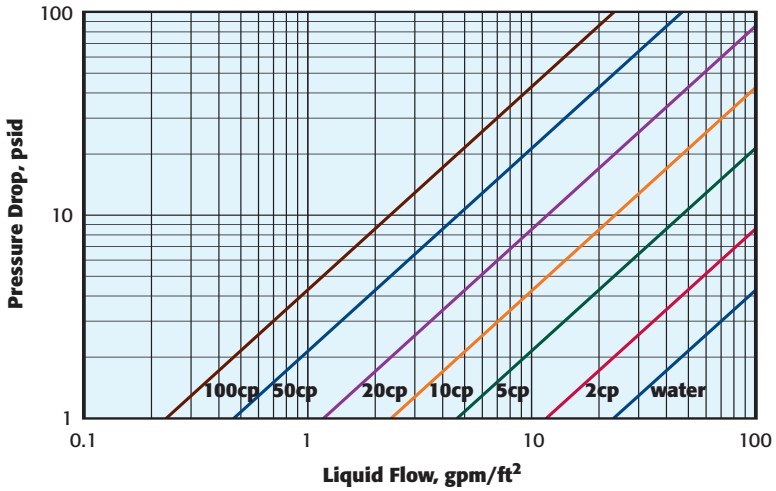
316L SS Rolled Sheet (cont'd).



Media Grade: 5
Thickness: 0.062 inches

Material Specifications
Bubble Point, in. of H_2O: 13.0 - 16.9
Tensile Strength, kpsi: 13.3
Yield Strength, kpsi: 9.2

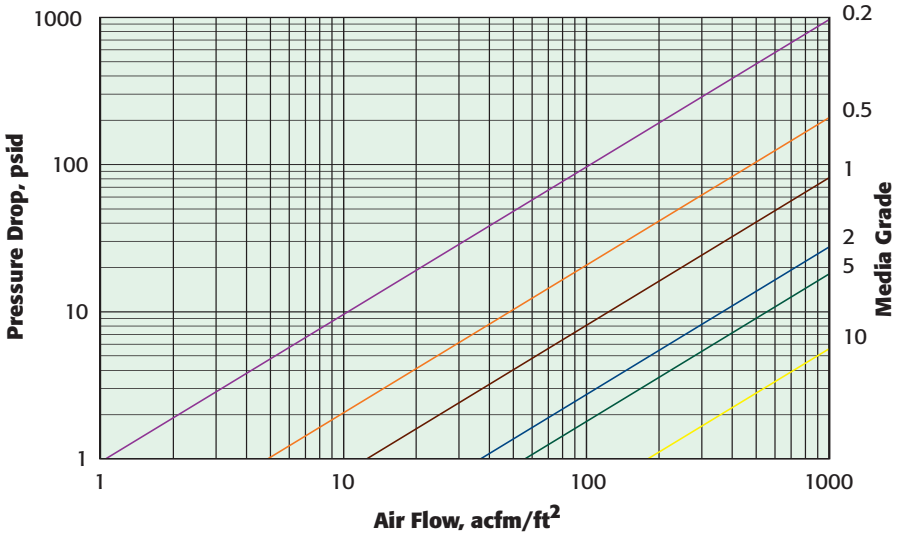
Permeability Coefficient
Liquid, K_L: 2
Gas, K_G: 20



Media Grade: 10
Thickness: 0.062 inches

Material Specifications
Bubble Point, in. of H_2O: 7.5 - 10.9
Tensile Strength, kpsi: 10.5
Yield Strength, kpsi: 7.5

Permeability Coefficient
Liquid, K_L: 0.7
Gas, K_G: 5.0



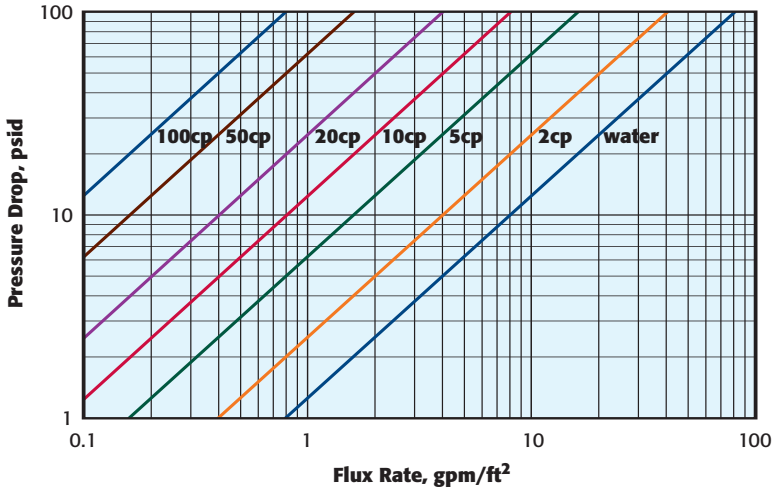
Air Flow for Grades 0.2 - 10

Note:
The Rolled Sheet samples are standard in thickness.

Permeability information.

316LSS Seamless Tubes.

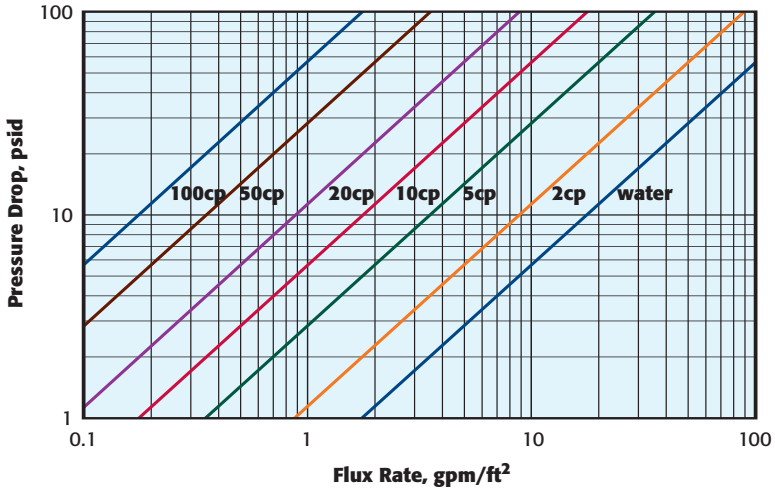
Note:
Tests run at 70°F with water, other curves generated using calculated formulas.



Media Grade: 0.5
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of Hg: 3.0 - 3.9

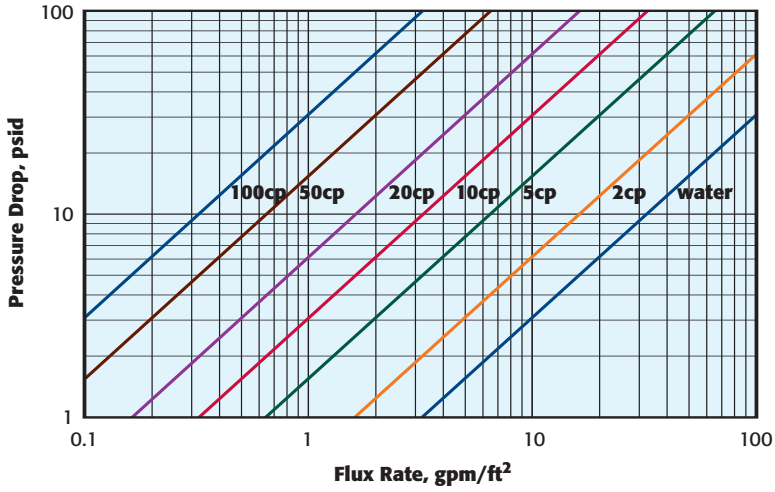
Permeability Coefficient
Liquid, K_L: 20.2
Gas, K_G: 154



Media Grade: 1
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of Hg: 2.0 - 2.5

Permeability Coefficient
Liquid, K_L: 9.2
Gas, K_G: 60



Media Grade: 2
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

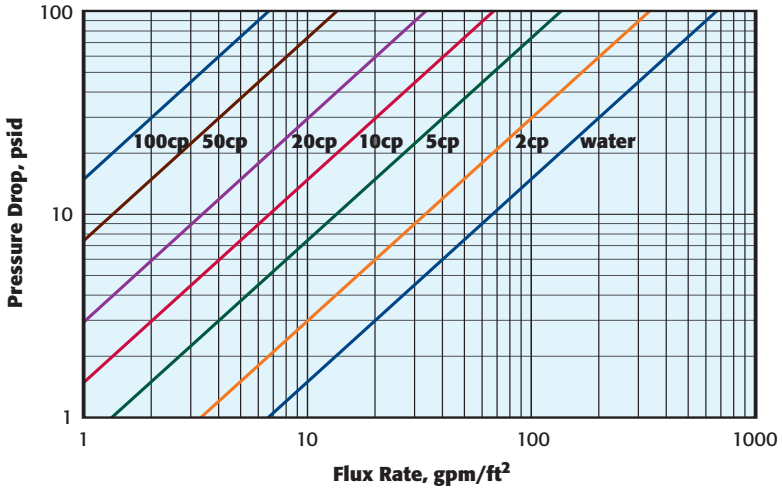
Material Specifications
Bubble Point, in. of H_2O: 17.0 - 24.0

Permeability Coefficient
Liquid, K_L: 4.9
Gas, K_G: 33

Permeability information.

316LSS Seamless Tubes (cont'd).

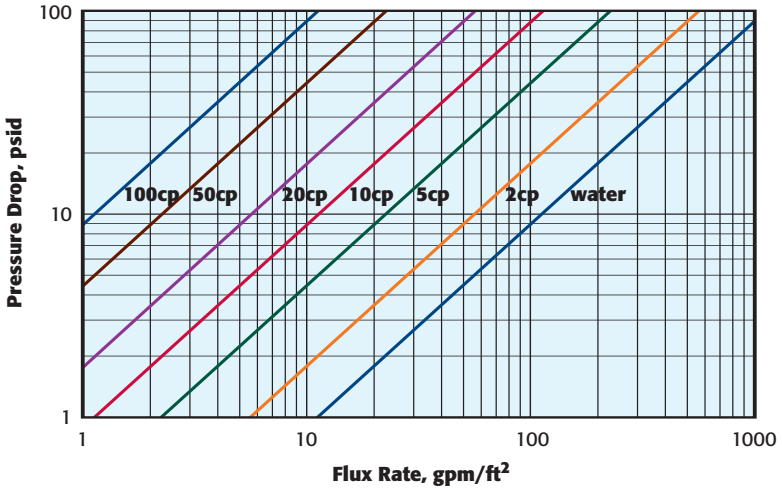
Note:
Tests run at 70°F with water, other curves generated using calculated formulas.



Media Grade: 5
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of H_2O: 13.0 - 16.9

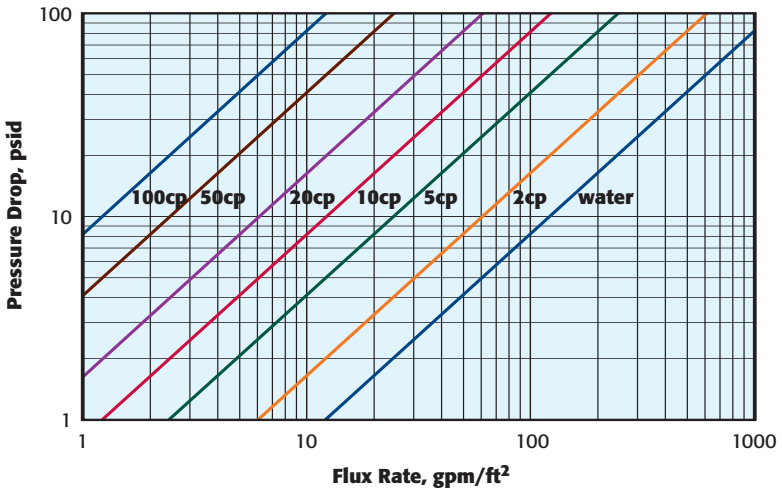
Permeability Coefficient
Liquid, K_L: 2.4
Gas, K_G: 11



Media Grade: 10
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of H_2O: 7.5 - 10.9

Permeability Coefficient
Liquid, K_L: 1.4
Gas, K_G: 4



Media Grade: 20
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

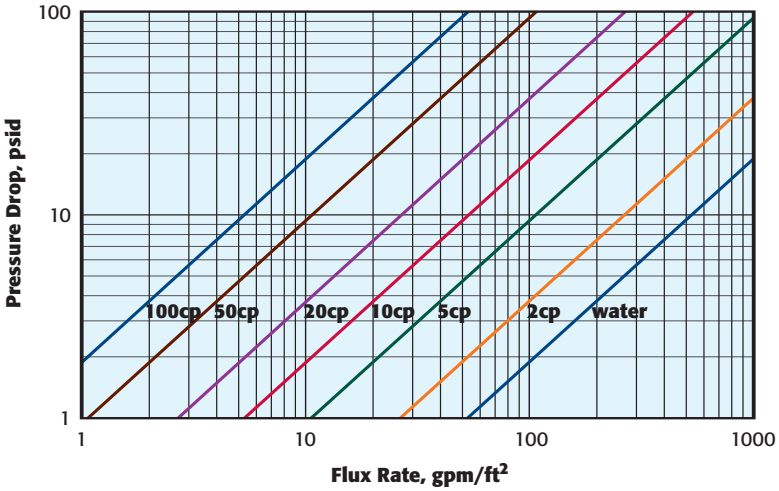
Material Specifications
Bubble Point, in. of H_2O: 5.0 - 7.0

Permeability Coefficient
Liquid, K_L: 1.3
Gas, K_G: 6

Permeability information.

316LSS Seamless Tubes (cont'd).

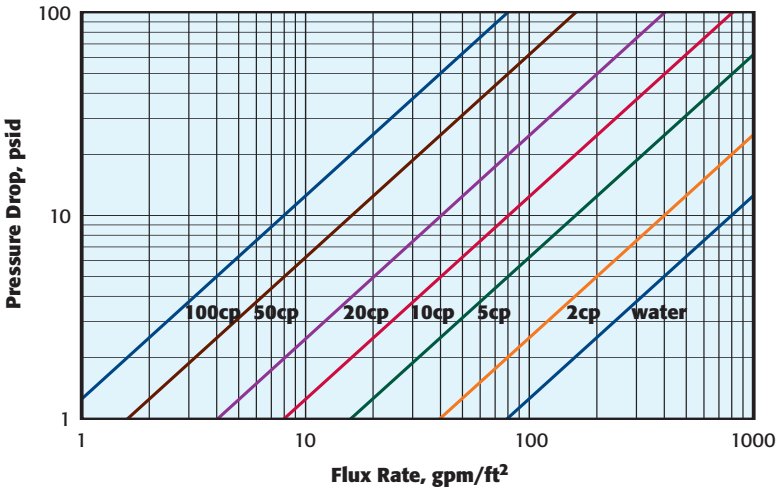
Note:
Tests run at 70°F with water, other curves generated using calculated formulas.



Media Grade: 40
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of H_2O: 3.0 - 4.0

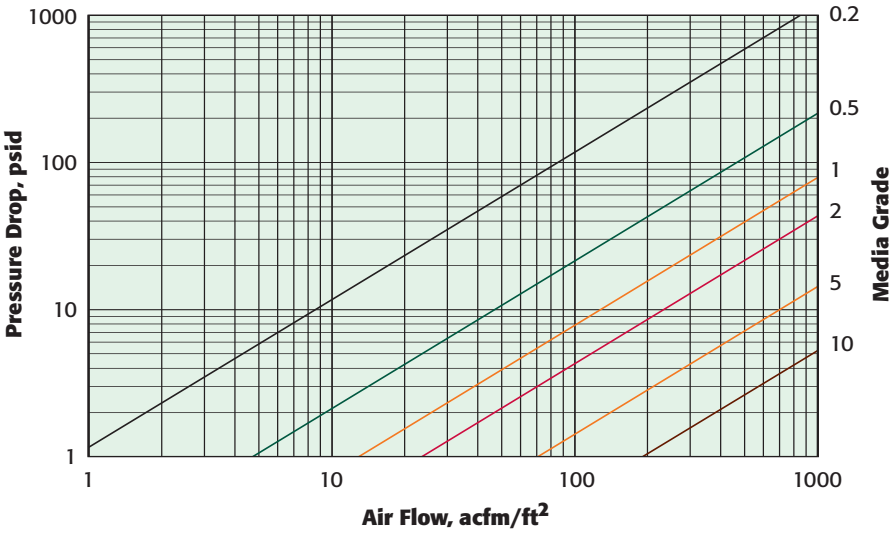
Permeability Coefficient
Liquid, K_L: 0.3
Gas, K_G: 2



Media Grade: 100
Outside Diameter: 0.500 inches
Inside Diameter: 0.375 inches

Material Specifications
Bubble Point, in. of H_2O: 0.5 - 1.5

Permeability Coefficient
Liquid, K_L: 0.2
Gas, K_G: 3



Air Flow for Grades 0.2 - 10

Note:
The Seamless Tubes have dimensions 0.5" OD x 0.375" ID.

Typical applications of Mott precision porous metal products.

Mott can be your Solution Provider.

This applications list is a quick review of the varied uses that have been developed for Mott precision porous metal products. Use this list as a handy reference, coupled with the unique design properties of porous media, to see how Mott products can solve problems for you.

Mott engineers can develop new ideas for product design or product and process improvement, using porous media in imaginative ways. Their experience in this field, backed by a commitment to technical service, provides the specialized help you need. Put Mott to the test – ask for an application analysis or design review.

Filtration Applications.

Chemical/Petrochemical

- Corrosive liquids, gases
- Air, nitrogen, carbon dioxide, argon, helium, ammonia
- Process steam
- Oxygen (filters cleaned and certified for 0_2 service)
- Solvents, ketones, esters, amines, liquid hydrocarbons, polymers
- Feedwater and makeup water
- High-temperature liquids, gases
- High-pressure ethylene gas
- Cryogenic fluids
- Ethylene glycol
- Catalyst retention, fluid bed reactors
- Catalyst recovery, slurry phase reactors
- High-efficiency solids recovery or liquid cycling

Food/Beverage

- Process steam filtration
- Catalyst recovery from hydrogenation reactors
- Polishing of syrups, liquors and other liquids
- Carbon removal for decolorization operations
- Bleaching clay filtration

Medical/Pharmaceutical

- Liquid drug delivery
- Fluid cooling filters
- Oxygenation for bioreactors/fermentors
- Flow control/safety devices for medical equipment

Electronics

- Filtration of oxide slurries for magnetic tapes
- Filtration of ink for high-speed printers

Instrumentation

- In-line filtration
- Chromatography solvents
- HPLC pump inlet check valve protection

Textile

- Nylon 6 and 6,6 production
- Polyethylene
- Rayon

Refinery

- Filtration of FCCU Slurry Oil

Energy

- Porous metal septa for powered resin filter/demineralizers
- Condensate polishing

Other Applications.

Gas-liquid contacting/sparging

- Carbonation
- Oxygenation
- Aeration
- Hydrogenation
- Dewatering oil

Nitrogen sparging

- Deoxidizing wines and other liquids
- Bulking mayonnaise and similar products

Chromatography column frits

Flame arrestors for instruments and analyzers

Breathers and vents

Wicks

Flow restrictors

Pressure snubbers

Fluidization

Vacuum lance for deaerating powders

Air platens for transport or support

Gas diffusion

Silencers

Fuel Cell Applications

Thermal Management

From porous media to complete filters, Mott delivers what you need.

Common Configurations.

Discs, sheets, cups, bushings and tubes for use in OEM products, filter assemblies, etc.

Unique solutions.

Mott takes the basic media one step further by incorporating porous structures into filter elements and cartridges, air rolls and vacuum rolls, snubbers, silencers, restrictors, instrument filters, inertial filters and components for melt polymer spinning.

HyPulse® filters.

For even greater convenience, Mott can provide porous filter elements complete with housings and fittings. We help you select proper sizes, inlet and outlet connections, materials for wetted parts and other features for high-efficiency filtration.

HyPulse filtration systems.

Mott HyPulse filters provide exceptional performance in many liquid/solids and gas/solids separation applications. Catalyst recovery, liquid clarification, calciner offgas and injection well protection are just a few applications where HyPulse filters are working today.

Established in 1959, Mott Corporation coordinates engineering, sales, service and manufacturing from two adjacent facilities totalling 90,000 square feet. Mott's skilled workforce, along with strategically located overseas affiliates, services thousands of customers all over the world, in virtually every major segment of industry.

Need a product? Need advice?

Call us either way. Whether you need a stock solution, a customized design, or simply guidance, we welcome your call. Contact the experts at Mott Corporation today.

mott *corporation*

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