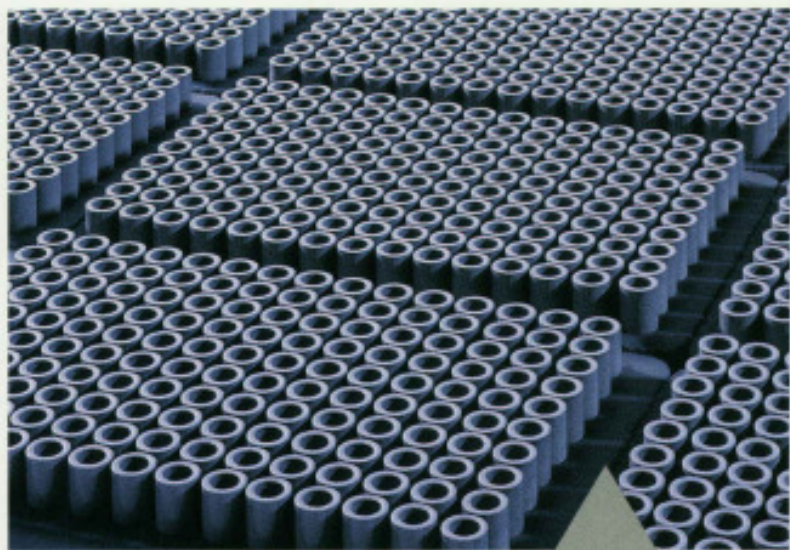
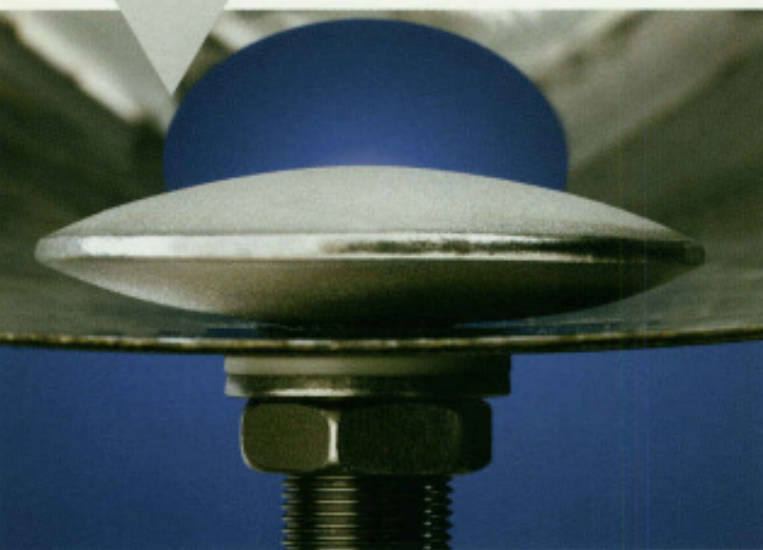




Tridelta Siperm

A Tridelta Group Company

SIPERM[®] – High permporous sintered materials



Fields of Application – multit talented for the most demanding of conditions

The use of high permporous material is indispensable for performing numerous industrial processes. In plant construction the perfect matching of sintered material to customers' process requirements make it possible to reach new levels

of performance and cost-rationalization. SIPERM® high permporous materials from Tridelta Siperma, have a proven track record of excellence in numerous different sectors of materials processing, especially whenever the material needs to be

temperature and chemical resistant, have high stiffness, storage capacity and reverse-washable. Furthermore, Siperma R and Siperma Hp comply to the regulations for the handling of food stuffs.



Controlled pore size

Siperma materials are available in a variety of porosity grades, which are achieved by varying particle shape, size and proportions of the powders used. Siperma R is made from spatter powders; Siperma B and Hp are produced from powders with a spherical particle shape.

Using this technique, pore size, and therefore the material's physical properties, can be set to the form required.



Flame arrestor

In gas welding technology the use of dry seals made of sintered metal have entirely replaced the older, hydraulic seals. Siperim sinter material insets have the following advantages:

- high flow resistance
- excellent permeability
- high thermal conductivity
- high mechanical strength
- high pore evenness.

Sound dissipation

The long, tortuous porosity of highly permporous materials makes them excellent insulators against sound. Airflow within the pores is agitated, becomes turbulent and slows, and the porous solid thus absorbing a portion of the sound wave energy. With normal sound absorbers the total sound insulation effect is approx. 20 dB (A).

Gasing and de-gasing fluids

An even pore distribution guarantees optimal gasing and de-gasing of fluids:

- oxygenation, e.g., of reservoirs or water purification plants
- de-gasing, e.g., car batteries.

Capillary transport of fluids

The surface tension forces that develop in the pore channels of Siperim materials are used to draw up fluid and deliver it at a given dosage e.g., the continuous oiling of mechanical components. An extension of the range of applications is that, with special treatment, the normally hydrophobic nature of PE can be rendered hydrophilic.

Compacting powders

If space is at a premium, then a compaction roller or suction pipe from Siperim materials can reduce powder by up to 20% of its bulk volume.



Filtration – separating the chaff from the wheat

In most manufacturing processes a means of filtering solids and fluids is essential. Siperma's filter materials more than meet the current heightened considerations for human safety, product quality and environmental safety.

Sintered filters are classical deep-bed filters that exhibit a predominantly internal mechanical filtration effect. Our material has an additional adsorptive effect, retaining a significant part of the solid particulate matter that, because of its

geometric proportions and those of the pores, might normally be expected to have passed through the filter. With gas filtration, due to the effect described above, particles approx. 1/3 of the pore size are retained. Siperma filters are used for deep-bed filtration in the following applications:

- with high viscosity fluids
- with high and low temperatures
- for separating out catalysts in suspension
- for fluids with pressure variation
- wherever good reverse washability and perfusion is needed.



Customized filter elements
from Siperma R

Siperm highly porosity filter elements also make excellent separators in drying plants:

- water from compressed air and gases in compressors, compressed air lines and recoolers
- oil from compressed air and gases in food, packing, textile and electronics industries
- particulate matter from compressed air, gases and fluids in the chemical, plastics industries, in bulk powder processing plants.



Standardized filter elements from Siperm R, Siperm B and Siperm Hp

SIPERM® – environmentally friendly

As far as environmental technology is concerned, Siperm filter material is the point of focus when dealing with compressed air, compressed air condensates, gases and fluids. Siperm process filters are used as protection against corrosion in plants for scrubbing gases of pollutants and those cleaning gases and industrial fluids (including aggressive and hot fluids). On account of Siperm filters' high chemical resistance, their use has the added advantage of improved safety.

High permoporous Siperm material distinguishes itself not just because of the greater economic benefits it brings, or its adaptability, but is also an excellent, modern, homogeneous gas separation system. Homogeneous distribution of pores, long working life and simple maintenance is only natural with Siperm.

An advantage of Siperm plastic sinter material Hp is that it is possible to manufacture pieces to almost any required shape or form, which is corrosion-resistant, hydrophobic or after special treatment, hydrophilic, chemical resistant and virtually friction-free.

Fluidization – problems vanish into thin air



Cam funnel from Siperin Hp

Using that very last angle

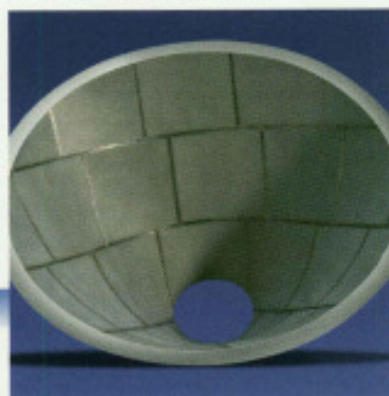
Fluidization is the term for a special application in the modern turbulence technology for the handling of small particulate bulk materials. The pneumatic principle of fluidization permits the use of greater angles for discharge funnels. This increase in angle means dramatically increased savings in space and cost: whether optimising the use of existing space or saving on complete silos. This is a particularly attractive advantage not just in terms of saving space inside buildings but also metering devices for weighing systems.

Storing, mixing and discharging bulk powder products, e.g. many plastic powders, flour, cement etc., often cause problems. They do not flow freely, form bridges, tunnels and 'rat-holes' around the silo outlet and can only be removed easily by resort to some sort of a discharge aid.

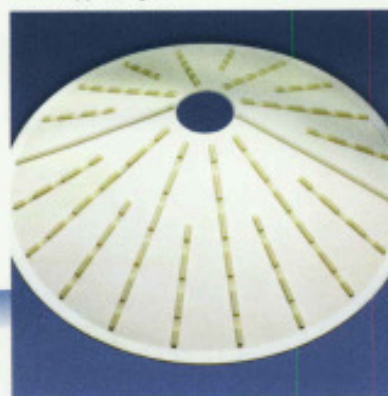
A proven solution to such problems is the pneumatic dispersion units made from Siperin materials (Hp, R, B or GFK) from Tridelta Siperin. They are economical, highly reliable, efficient and occupy little space.

When fitting-out large silo areas with dispersion units, it is advantageous to divide them into sectors, which each of which can be interchangeably perfused. In this way it is possible to use a large perfusion area effectively with relatively little volume flow. In most cases it is sufficient to compensate the pressure produced during loading with that of the fluidization medium blown-in.

Fluidizing cone from Siperin R



Fluidizing cone from Siperin Hp with supporting ribs



An overview of Siperm fluidization materials

- specific selectable pore size
- an even air distribution across the entire surface area
- seamless construction throughout the perfusion element
- no accessory support structures needed
- high mechanical stiffness
- suitable for use with food-stuffs (Siperm R and Hp)
- high temperature resistance
- high chemical resistance
- long working life
- simple installation.

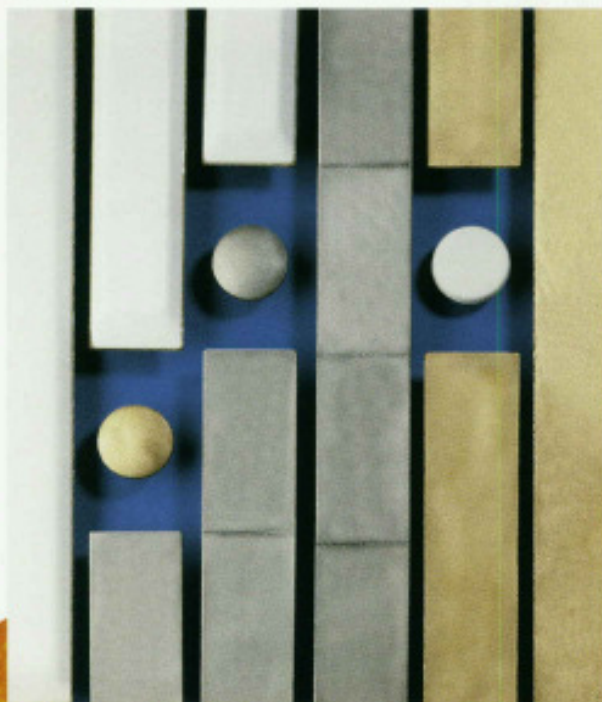
Siperm perfusion elements come in a wide variety of different forms: perfusion cushions and boxes, discs, tubes or funnels fitted with customer-tailored fastenings.

Homogenization and fluidized bed conveyance – the bulk material keeps on flowing

For homogenization purposes low flow rate perfusion is no longer adequate. The floors of homogenization silos mostly consist of highly permeable Siperm plates. During operation of the plant it is important to ensure that the air speed is high enough to create an homogenous layer of turbulence sufficient to ensure the different components are adequately mixed.

In addition to fluidization and homogenization, highly permeable Siperm materials are particularly suitable for the construction of fluidized-bed conveyors and for porous floor plates in (powder-) agitator tanks.

Standardized fluidization components from Siperm Hp, Siperm R and Siperm B



Fluidizing cone from Siperm GfK



The Material – from raw material to end product

Manufacture

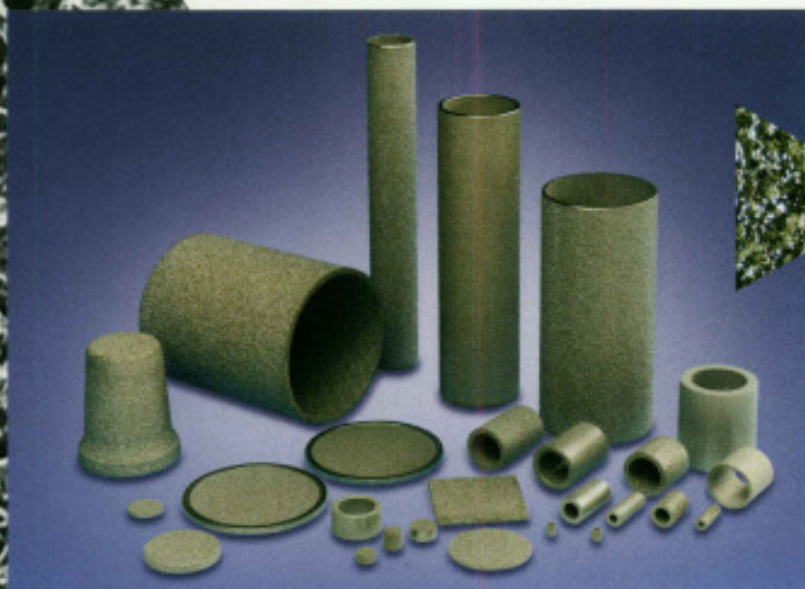
Two different sorts of powders are commonly used for manufacturing highly permporous sintered solids:

1. Spattered Powders

The powders are cold pressed to form a blank of the density required (green compact density). This so-called green compact is sintered at a temperature corresponding to the material, either in a protective atmosphere or vacuum furnace, without a mould, or the use of any additional force.

2. Globular Powders

These powders are filled as bulk material into a mould and vibration-compacted. Sintering takes place in a mould, without any additional pressing force, in special furnace atmosphere. This production technology also allows the solid or porous screw-studs to be sintered onto the core material.



Product samples
from Siperam R

Temperature resistance

- Siper R
500°C oxidizing atmosphere
650°C reducing atmosphere
- Siper B
200°C oxidizing atmosphere
350°C reducing atmosphere
- Siper Hp
approx. 70°C oxidizing atmosphere
approx. 70°C reducing atmosphere
- Siper GfK
approx. 120°C oxidizing atmosphere
approx. 120°C reducing atmosphere



Product samples
from Siper B

Scaling and Corrosion Resistance

The scale resistance properties of Siper materials are essentially comparable to those of the corresponding compact raw materials.

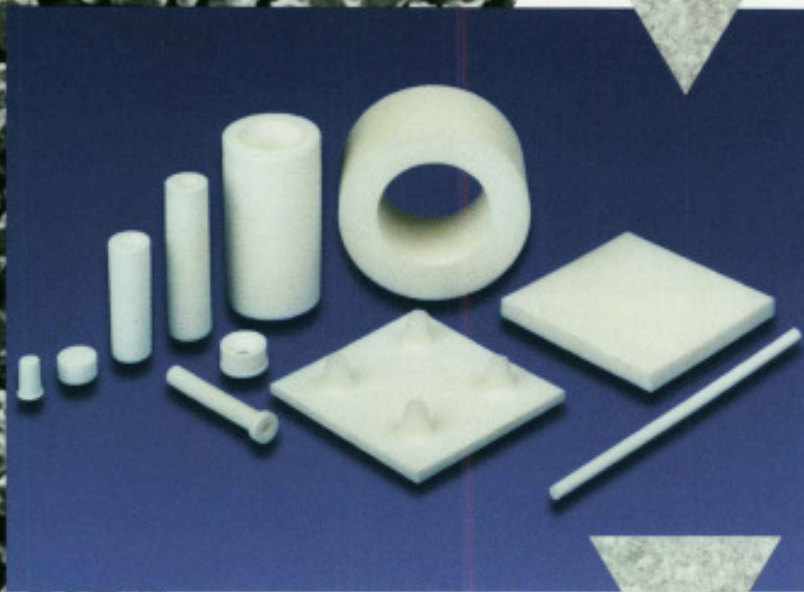
However, when using highly porous materials in the higher temperature range it should be taken into account that, depending on the material, the higher the temperature the greater the decrease in mechanical strength.

Considering the corrosion resistance of highly porous sintered materials, the following should be noted:

compared to solid materials, porous solids have a vastly increased surface area and, because of the

close relationship between surface area and corrosive activity, are therefore far more susceptible to corrosive attack.

This, however, does not apply to Siper Hp whose chemical resistance is equivalent to that of solid material.



Product samples from Siperin Hp

Quality Assurance

To guarantee constant high quality properties our Siperin products are subjected to the following series of tests:

- bubble Point Test
(ISO Standard 4003-1977)
determination of maximum pore size
- permeability Test
(ISO Standard 4022-1977)
determination of specific permeability
- electronically controlled testing of
 - admission pressure
 - differential pressure
 - flow rate
 - velocity
- porometer measurements
for determination of pore size distribution
(acc. to ASTM E 1294-89)
- determination of filter separating capacity ratings – support by independent institutes assays
- determination of the tensile and shearing strength
(DIN 30910, Part 2)
- customized measurements.

MPA NRW

Certified Qualified Management System according
to DIN EN ISO 9001, Reg. No.: MPA NRW Q 234

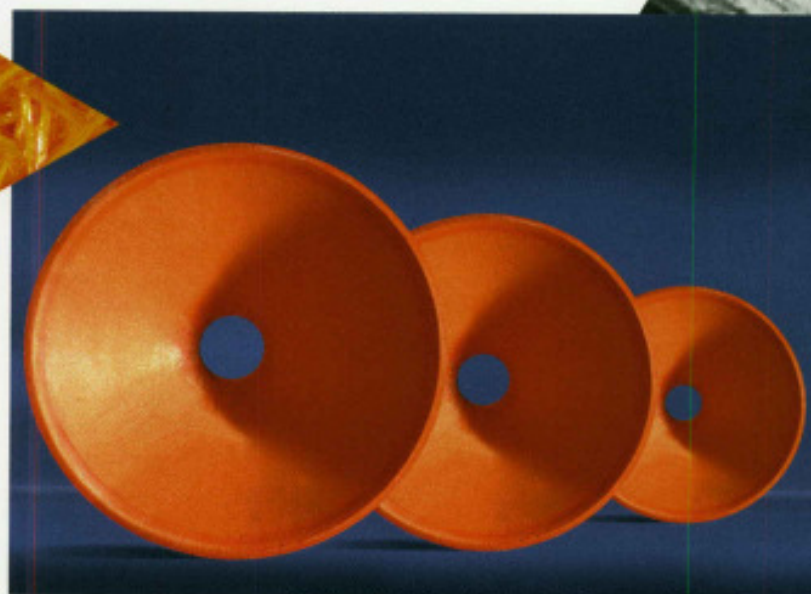


Quality management

Delivering products and services of very highest of quality standards is indisputably the challenge of the market. In order to guarantee the maintenance and continuance of these standards, we have instituted the following measures:

- fulfilling customers' requirements by offering reliable products and services, effective advice and exemplary completion of contracts
- avoiding errors instead of making subsequent corrections
- securing and retaining customers' trust and recognition by maintaining exemplary conduct and efficiency
- a staff dedicated to maintaining quality standards agreed with customers and suppliers.

Only by applying comprehensive and reliable quality assurance measures at all levels ensures the product and services quality demanded by customers. Our efforts in pursuing this object have secured us DIN EN ISO 9001 certification.



Product samples
from Siperm GfK

SEM: Siperm GfK

Machining and cleaning

Machining

Siperm materials R, B and Hp can be rolled, bent, pressed, stamped, milled, turned or drilled, either cold after gentle heating. Siperm materials with a finer pore structure are generally more suitable for machining than those of a coarser grade.

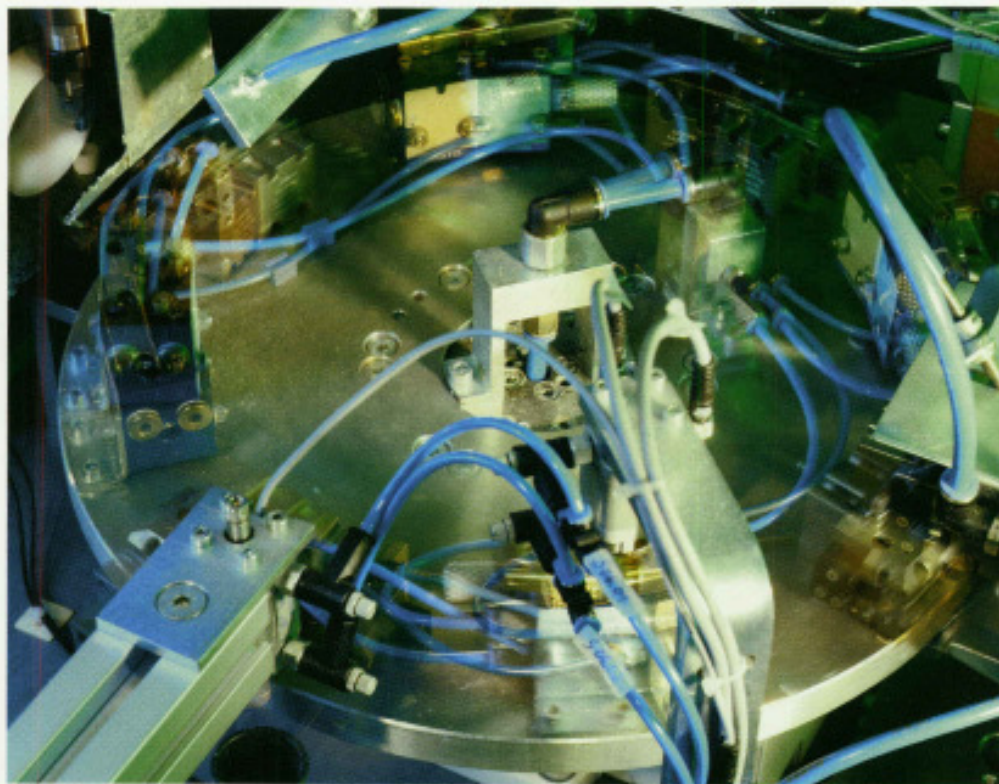
Any machining should avoid following the direction of perfusion flow, as the pores could become blocked – electrical machining discharge is, however, possible. When scrolling or bending Siperm R or B plates, it should be noted that the minimum bending radius is dependent on pore size and the material's strength.

Siperm semi-finished products can be joined by welding, riveting or bonding, both to other Siperm components or different materials, to form units or components of any size.

Siperm GfK can be drilled, sawed and ground. As with all other Siperm material, we also manufacture ready-to-install units.

Mechanical Treatment Data

Turning	Siperm R	Siperm B	Siperm Hp
Tool shape	Pointed finishing or side tool	Pointed finishing or side tool	Pointed finishing or side tool
Hard metal grades	ISO/ANSI K 20	ISO/ANSI K 20	
Effective cutting angle	12°	10°	5 – 30°
Clearance angle	7 – 9°	10°	10 – 15°
Depth of cut	0.4 mm	0.5 mm	0.1 – 0.5 mm
Cutting speed	10 – 30 m/min	100 – 300 m/min	200 – 500 m/min
Welding	Porous sintered metal materials are welded by TIG.		Hot gas and heated tool welding
	The material must be free of dirt and grease.		
	The welding speed must be as high as possible to achieve optimal reduction of heat influx into the material.		
Filler material	Thermanit JE-308L Si or GE-316L Si	Bronze wire CuSn 9 or CuSn 10	Polyethylene wire (Natural PE)
Inert gas flow	5 l/min	5 l/min	
Electrode diameter	1.4 – 4 mm	1.5 – 3 mm	3 – 5 mm
Current strength	100 – 150 A (L = 3 mm)	70 – 120 A	
Welding temperature			200 – 250 °C



An automated processing machine for Siper HP

Siper GfK

Drilling, sawing and grinding are possible for units ready to be installed.

Possible cleaning methods

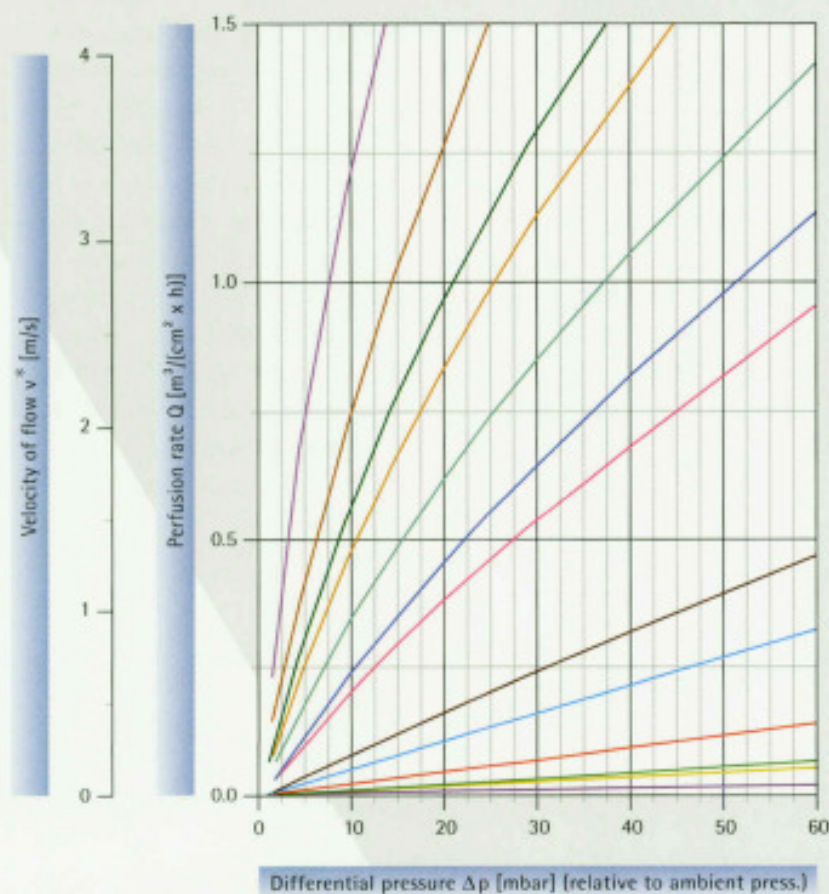
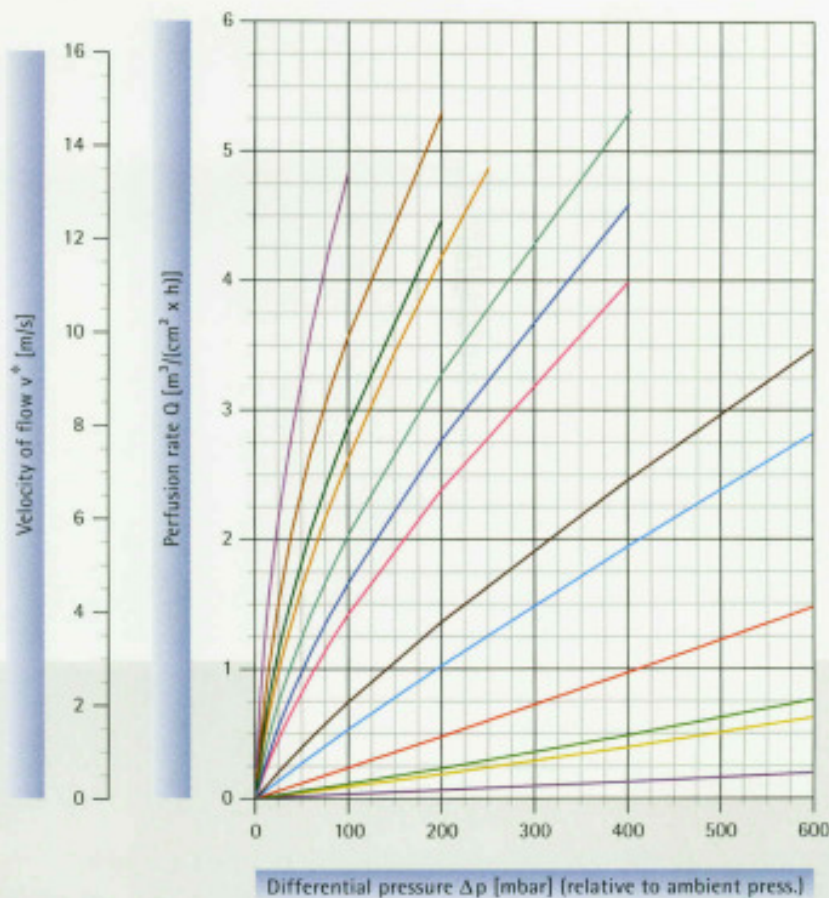
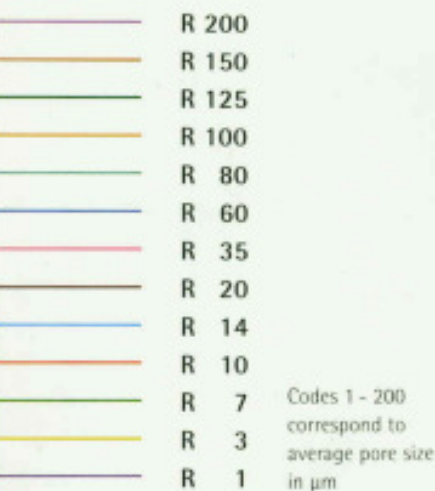
In simple cases, i.e. when all impurities are retained on the surface of the filter element without the penetration of particles into the pore channels, cleaning Siper materials by reverse washing, (back-flushing), with a liquid and/or gas is usually sufficient. Use of a soft-bristled nylon brush can aid cleaning.

If back-flushing proves to be inadequate, in other words the filter's interior is still soiled, then cleaning with a solvent is recommended.

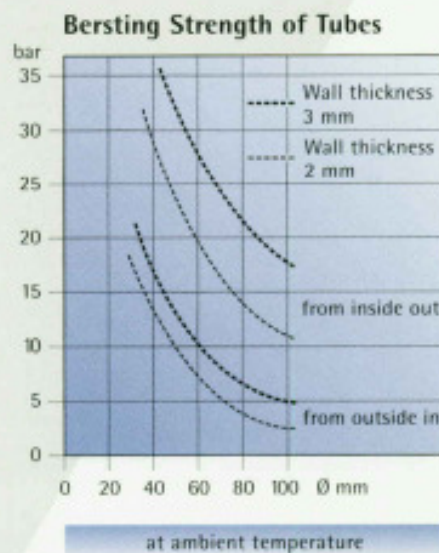
The length of cleaning and the temperature used can be varied according to the degree of contamination. However, as a word of caution, it should not be forgotten that compared to solid material, highly permeable sintered material has a vastly increased surface area and thus is far more susceptible to any aggressive cleaning medium. For this reason, cleaning times and temperatures should be no greater than those strictly necessary. And as a matter of course, cleaning should be completed by purging with a neutral medium such as water, even hot water suffices.

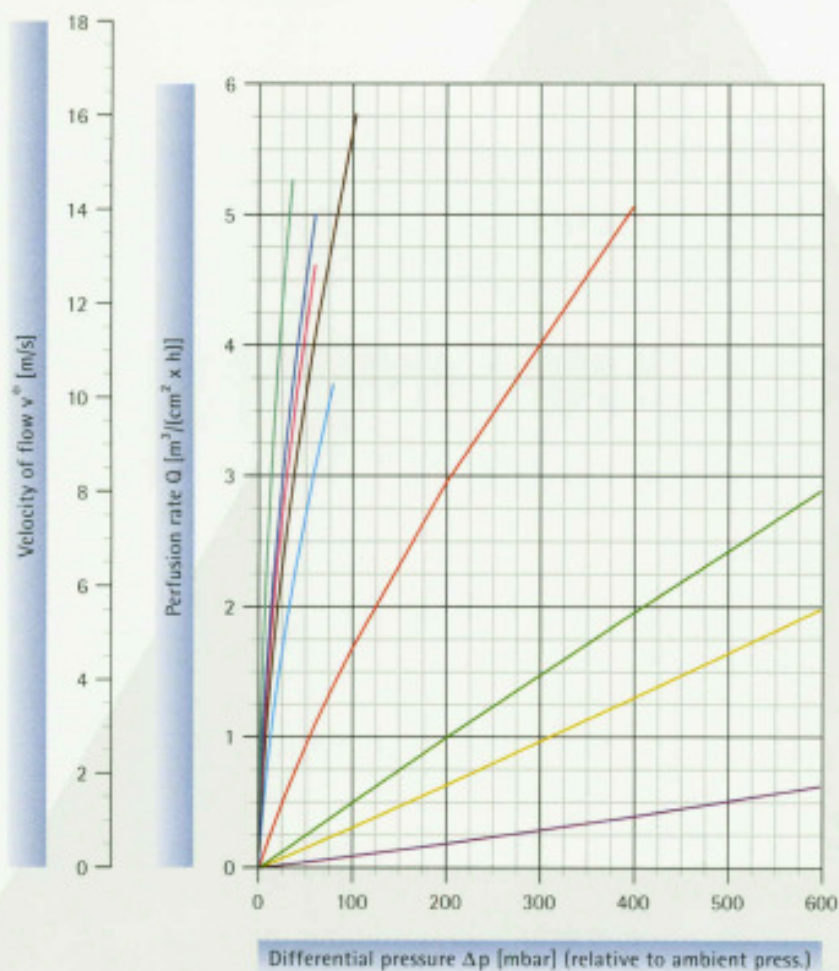
Permeability

Perfusion medium air at 20°C

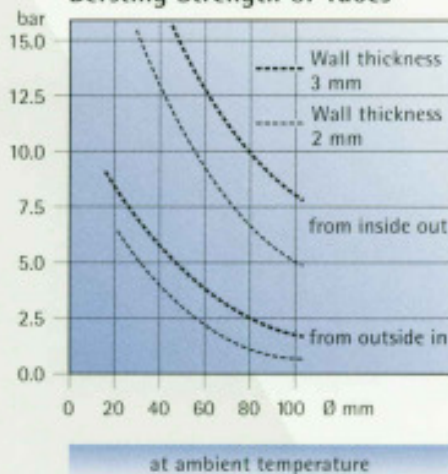


Perfusion behaviour of Siper R disc (d. 80 mm x 3 mm)
surface area perfused: 20 cm^2
Perfusion flow curves correspond to material thickness of 1 mm

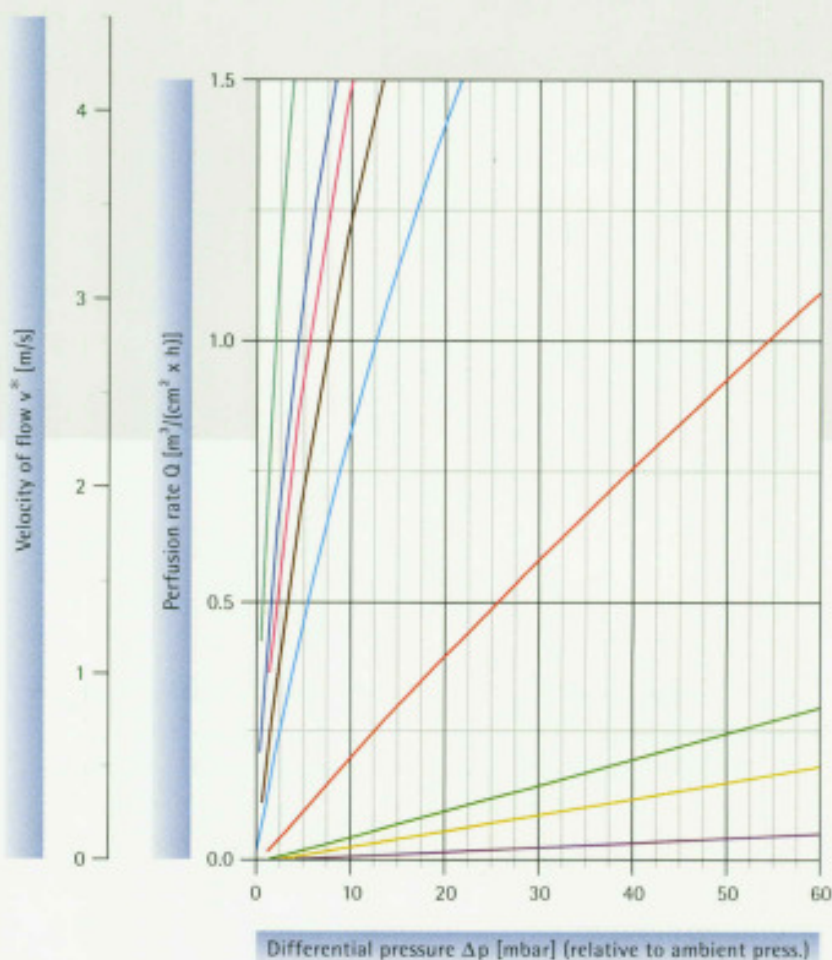
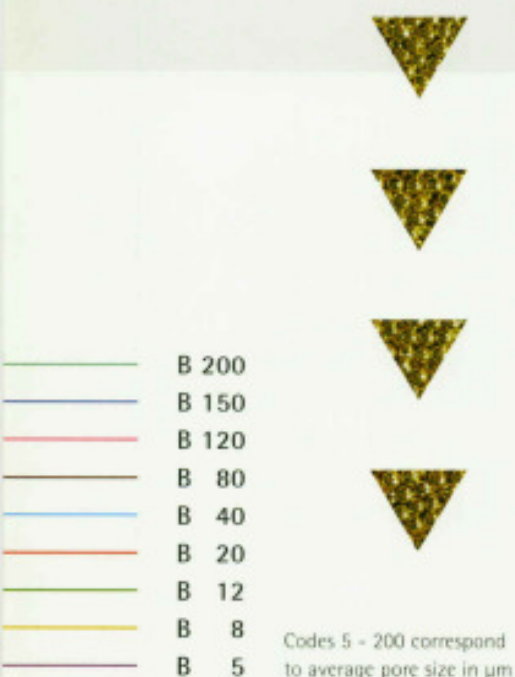


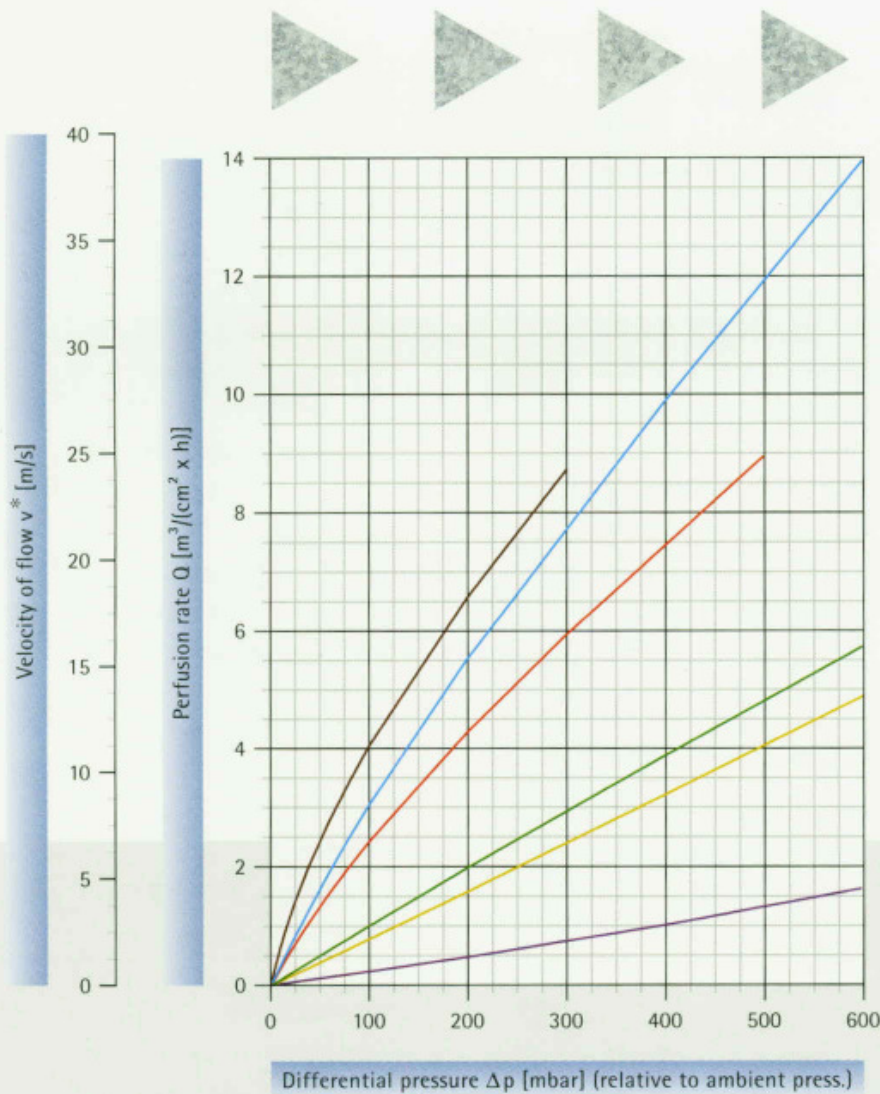


Berusting Strength of Tubes

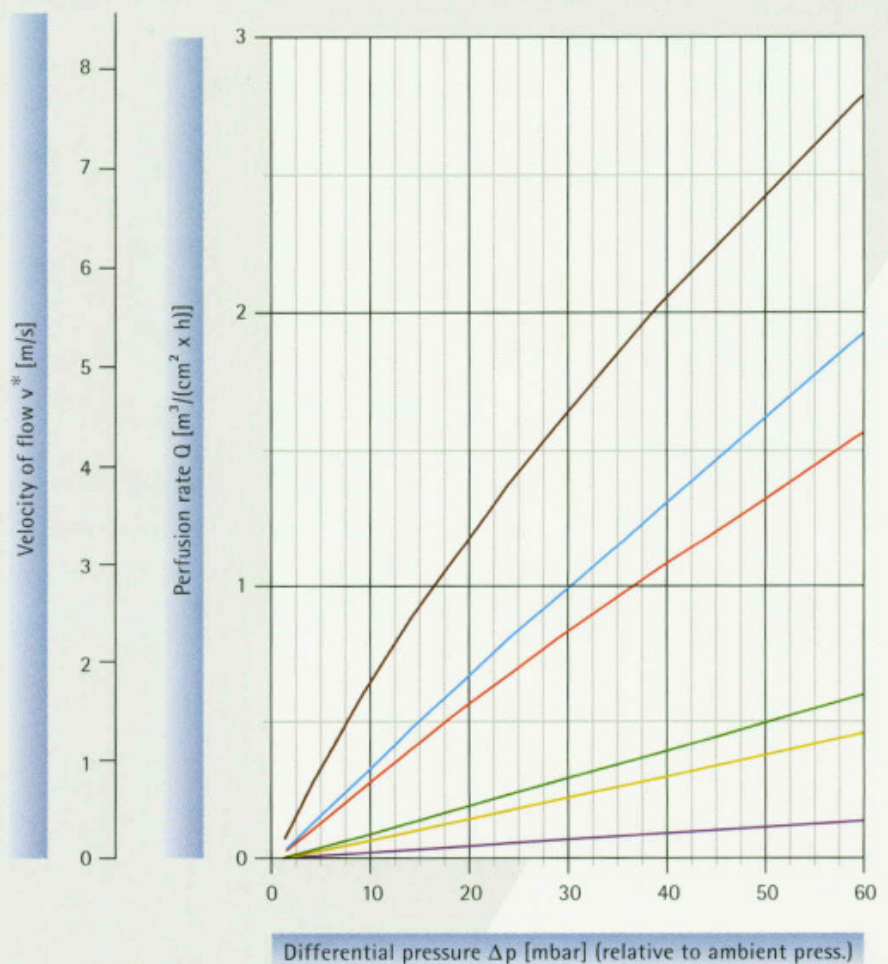


Perfusion behaviour
of Siper B
disc (d. 80 mm x 3 mm)
surface area perfused: 20 cm^2
Perfusion flow curves correspond
to material thickness of 1 mm





Perfusion behaviour
of Siper HP
disc (d. 80 mm x 5,7 mm)
surface area perfused: 20 cm^2
Perfusion flow curves correspond
to material thickness of 1 mm



$^*1 \text{ m}^3/(\text{cm}^2 \times \text{h}) = 2.778 \text{ m/s}$

Product Range



Siperm R **(Stainless steel AISI 316L)**

- Standard plates
Size: 220 x 280 mm and
250 x 250 mm
Thickness: 2 – 10 mm
- Tubes, also isostatically pressed
Diameter: 5 – 100 mm
Length: max. 1000 mm

Siperm R, B and Hp

- Shaped parts and discs

We have at our disposal a comprehensive tool park for the production of components of different shapes and sizes. We are pleased to answer your question about our products.

Ask us for appropriate data sheets.



Siperm GfK **(Glass reinforced polyester or vinyl resin)**

- Plates
Size: max. 2000 x 1000 mm
of any thickness
- Discs
Diameter: max. 1000 mm
of any thickness
- Cones for fluidization



Siperm B **(Bronze CuSn 10)**

- Standard plates
Size: max. 450 x 1000 mm
Thickness: 2 – 10 mm
Specials on request
- Seamless tubes
Diameter: 5 – 80 mm
Length: max. 200 mm
Specials on request



Siperm Hp **(PE-UHMW)**

- Standard plates
Size: max. 1000 x 1200 mm
Thickness: 3 – 20 mm
Special:
Size: 2000 x 1000 mm
- Cam plates
Size: 850 x 850 mm
Thickness: 5 or 8 mm
Cams sintered directly onto
plates make special supporting
structures superfluous!
- Seamless tubes
Diameter: 5 – 180 mm
Length: max. 1000 mm
Specials on request
- Weldless cones
Diameter: max. 520 mm
Height: max. 400 mm

Fluidization units

- Siperm R, B and Hp
- Point aerator: Ø 100 mm
- Perfusion cushions:
Length: 250 – 1000 mm
- Fluidizing channels built to
customer specifications

Filter tubes

- Siperm R, B and Hp
- Diameter: 20 – 200 mm
- Length: max. 1000 mm, seamless
- Threaded connectors according to
customers' specifications

Weld construction

- The complete range of Siperm
materials can be welded to the
desired size and shape. Generally,
we construct according to your
drawings.

Engineering

- testing bulk powder fluidization
properties
- selection of optimal Siperm
materials
- we are delighted to work out
complete systems with our
customers

This document serves as a description of the properties and uses of the materials and products respectively.

Any commitment with respect to specific properties or a particular application requires special written agreement.

Although all data and contents included in this brochure have been conscientiously compiled and checked for accuracy, we accept no liability in the event of mistakes or defects.

Furthermore, we reserve the right to make changes as the result of further development.

The contents of this brochure supersedes that of all previous releases.



Tridelta Siperma

A Tridelta Group Company

The Tridelta Group: Fields of Activity

NdFeB-Magnets (NEOLIT®)	
SmCo-Magnets (SECOLIT®)	
AlNiCo-Magnets (OERSTIT®)	
Hard Ferrite Magnets (OXIT®/MANIPERM®)	
Soft Ferrites (MANIFER®)	
	Magnet powders/Ferrite powders
	Pigments
Components, Sub-assemblies	
Magnet systems	
Magnet and Process Technology	
	Surge arresters
Tools and tooling equipment	
Training and further education	
	High permporous sintered materials (SIPERM®)

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