SIPERM®
HIGH POROUS SINTERED MATERIALS

Customized SIPERM® solutions for industrial + technical applications

Tridelta Siperm
A TRIDELTA-Group Company

SIPERM® ALLROUNDERS FOR HIGHEST DEMANDS

Since 1953 we produce highly porous sintered materials at our site in Dortmund. Our many years of varied experience in the processing of PE (SIPERM® HP), Stainless steel (SIPERM® R) and Bronze (SIPERM® B) to high porous plates, pipes, molded parts and customized welding constructions makes us a competent partner in the search for the best solution for your specific application problem.
Tridelta Siperm GmbH, formerly belonging to the Thyssen AG, is now a subsidiary of Tridelta GmbH.

SIPERM®
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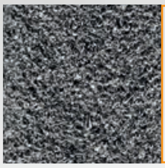
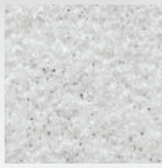
MATERIALS

 R

SIPERM® R
Stainless steel AISI 316L

 B

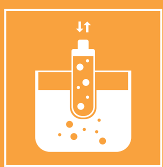
SIPERM® B
Bronze CuSn 10

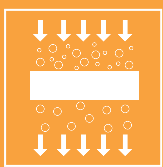
 HP

SIPERM® HP
Polyethylene PE

APPLICATIONS

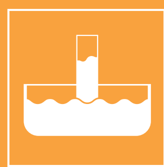

Bulk material handling


Gasing / Degasing


Filtration


Silencing

Safety technology


Capillary transport

ENGINEERING / SERVICE

- Individual application consulting

Material SIPERM® R

R

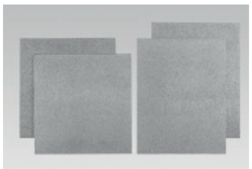
Stainless steel AISI 316L / 1.4404

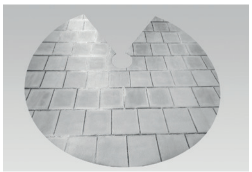
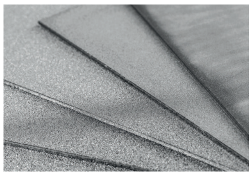
Temperature resistance: 500 °C oxidizing atmosphere / 650 °C reducing atmosphere

Product overview

- **Plates**

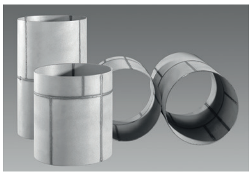
Size: 280 x 220 mm and 250 x 250 mm, seamless
Thickness: 2 - 10 mm
other sizes (weldments and cuts) upon request



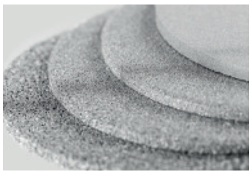
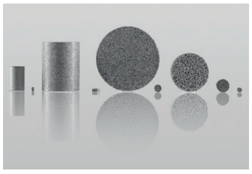
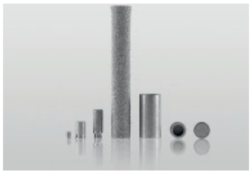
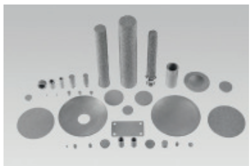
- **Tubes**

seamless and as weldment – dimensions upon request
max. diameter for seamless tubes: 100 mm
max. length for seamless tubes: 1000 mm


- **Discs and shaped parts**

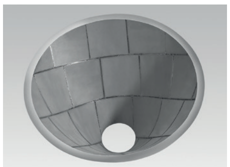
For the production of discs and shaped parts of different sizes, we have a comprehensive tool park at our disposal. Upon request, we will be pleased to inform you on available sizes and special shapes.

- **Fluidization units**

Aeration spot: Ø80 mm, Ø100 mm, Ø105 mm
Aeration pads: 250 x 125 mm, 500 x 125 mm, 1000 x 125 mm and according to customer specification
Fluidization bottoms according to customer specification



- **Filter cartridges**

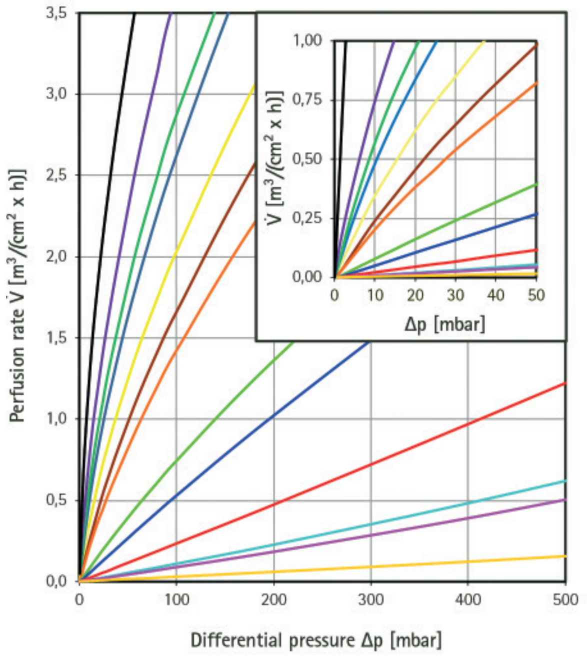
seamless and as weldment – dimensions upon request
max. diameter for seamless tubes: 100 mm
max. length for seamless tubes: 1000 mm



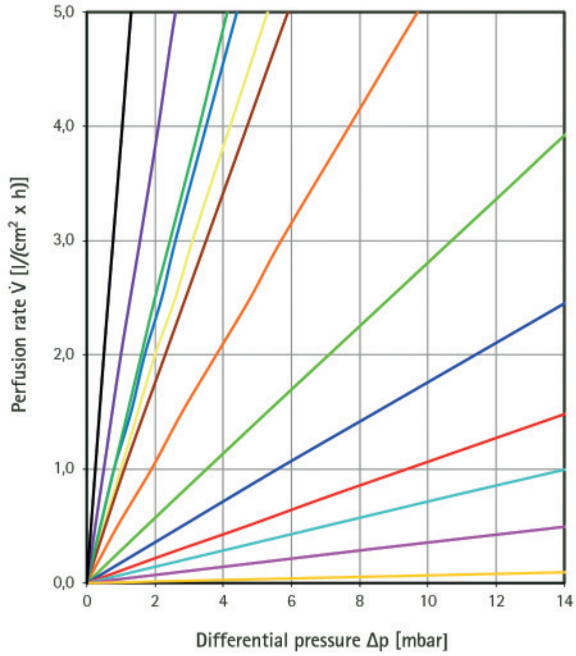
Permeability according to DIN ISO 4022

measured on discs (Ø80 x 3 mm) / surface area perfused: 20 cm² / correspond to 1 mm material thickness

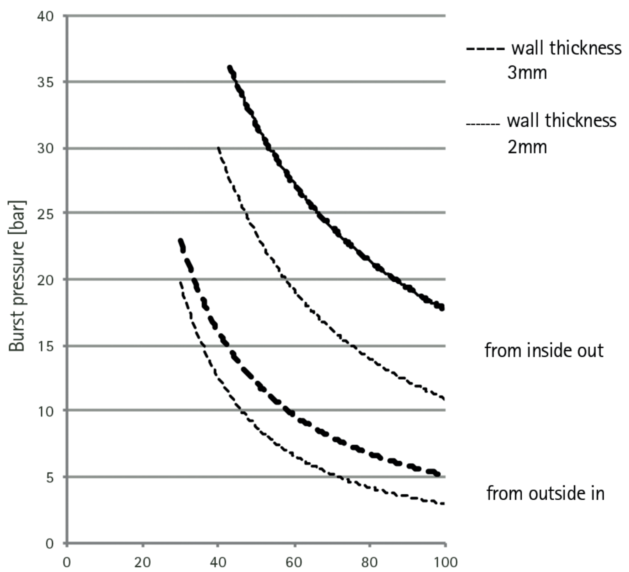
Air at 20 °C

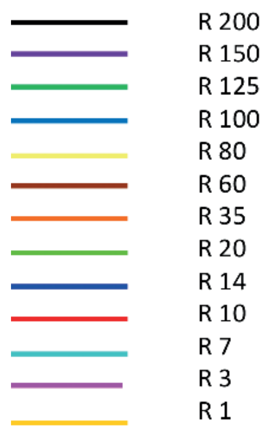


Water at 20 °C



Bursting strength of tubes





Technical data

Stainless steel AISI 316L / 1.4404
Temperature resistance: 500 °C oxidizing atmosphere / 650 °C reducing atmosphere

Filter grade	Density	Porosity	Specific flow coefficient		Separation efficiency (liquid) 98 %	Porometer ø pore size	Bubble Point Pressure difference	Shear strength	Tensile strength	Bending strength		
	[g/cm³]	[%]	laminar [m²] x10⁻¹²	turbulent [m] x10⁻⁷	[µm]	[µm]	[Pa]	[N/mm²]	[N/mm²]	δ el [N/mm²]	δ 0,1 [N/mm²]	δ Breakage [N/mm²]
R 1	5,9 - 6,3	21 - 26	0,2	0,1	4	1,1	6225	390	120	50	75	340
R 3	5,2 - 5,6	30 - 35	1	1	5	2,8	4245	320	110	50	70	310
R 7	5,0 - 5,4	32 - 37	2	6	9	4	3325	280	110	50	70	280
R 10	4,9 - 5,3	33 - 38	3	8	14	6	2535	240	100	50	70	230
R 14	4,7 - 5,1	36 - 41	5	15	18	8	1865	210	90	40	60	200
R 20	4,6 - 5,0	37 - 42	8	30	30	13	1475	180	80	30	40	190
R 35	4,5 - 4,9	38 - 43	15	45	37	20	1015	170	70	30	40	180
R 60	4,4 - 4,8	39 - 44	25	55	49	25	835	160	60	20	30	170
R 80	4,3 - 4,7	40 - 45	28	68	55	32	705	140	50	20	30	140
R 100	4,1 - 4,5	43 - 48	33	140	62	34	645	120	40	20	25	110
R 125	4,0 - 4,4	44 - 49	35	145	65	37	555	110	40	15	20	100
R 150	3,8 - 4,2	46 - 52	55	184	95	41	415	90	35	10	15	95
R 200	3,6 - 4,0	49 - 54	112	300	110	65	215	80	30	10	10	90
	EN ISO 2738	*DIN ISO 30911-3*	*DIN ISO 4022*		*according to ISO 4572*	*ASTM E1294*	*DIN ISO 4003*	*DIN ISO 30911-6*	*according to EN ISO 2740*	*according to DIN ISO 3325*		

All stated values are mean values; the single values can differ according to the dimensions of the components.

Machining instructions

Turning	Tool shape:	Pointed finishing or side tool
	Hard metal grades:	ISO / ANSI K 20
	Effective cutting angle:	12°
	Clearance angle:	7 - 9°
	Depth of cut:	0.4 mm
	Cutting speed:	10 – 30 m/min
Welding	Porous sintered materials are welded by TIG. The material must be free from 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-308 L Si or GE-316 L Si
	Inert gas flow:	5 l/min
	Electrode diameter:	1.4 – 4 mm
	Current strength:	100 – 150 A (L = 3 mm)

Machining

SIPERM® R can be rolled, bent, pressed, stamped, milled, turned or drilled, either cold after gentle heating. SIPERM® R 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 – water jet cutting and electrical discharge machining is, however, possible. When scrolling or bending SIPERM® R plates, it should be noted that the minimum bending radius is dependent on pore size and the material´s strength. Generally, however, the radius should not be less than 10 times the wall thickness.

SIPERM® R 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.

Please do not hesitate to contact us!

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Cleaning instructions

When all impurities are retained on the surface of the filter element without the penetration of particles into the pore channels, mechanical cleaning is usually sufficient. The counterflow cleaning is not sufficient when impurities have solidified inside the filter. Then we recommend the chemical dissolution of the residue in solvents which do not attack the filter.

Mechanical cleaning

This can easily be done by reverse washing (back-flushing) in a clean liquid or gas without disassembling the SIPERM®-component. The medium used for the reverse-washing process may either be the filtrate itself or the medium which is flowing through the SIPERM®-component. It is however recommended to work with a gas counter-flow, if the filtrate is a gas, or with a liquid counterflow, if it is a liquid filtrate. If very dirty, the cleaning process is more thorough, the more often it is repeated.

Also possible is the back-blowing with a hot steam, for instance for vapor degreasing with a steam cleaner.

The cleaning effect in counterflow can be supported by gently brushing with a soft brush (nylon brush). It is recommended to carry out this process simultaneously with the passage of the counterflow-medium in order to prevent further accumulation.

For smaller, removable filter parts, the ultrasonic cleaning by the resonance method is possible.

Chemical cleaning

The choice of the suitable solvent as well as the success of the cleaning process depends on the nature of the impurity. Therefore, recommendations can only be very general.

For the cleaning of SIPERM® R the following media can be used:

- All standard solvents such as benzene, carbon tetrachloride, alcohol, acetone
- Acetic acid up to 25 % (30 - 60 min)
- Hydrochloric acid up to 10 % (max. 30 min)
- Nitric acid 20 % (30 - 120 min)
- Alkali- and alkaline earth metal solutions

It is not advisable, to use highly concentrated acids or alkalis at higher temperatures. Neutralization with hot water should be done in every case.

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 porous sintered material has a vastly increased surface area and thus is far more susceptible to any aggressive cleaning medium. For this reason, the cleaning time and cleaning temperature must not exceed the absolutely necessary level.

Depending on the application it must be ensured that the highly porous sintered parts are dried thoroughly after cleaning. Cleaning with solvents in any case requires a complete drying of the porous sintered component before reuse. Solvents should under no circumstances be used for the cleaning of sintered components, which operate in systems where, for safety reasons, the use or insertion of solvents is prohibited.

In the case of metallic materials calcination is also possible, i.e. burning of crop residues at higher temperatures.

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Material SIPERM® B

Bronze CuSn 10

Temperature resistance: 200 °C oxidizing atmosphere / 350 °C reducing atmosphere

B

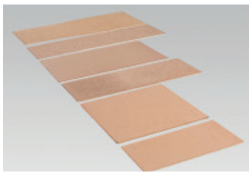
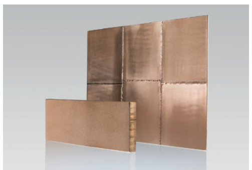
Product overview

- **Plates**

Size: 250 x 500, 500 x 500, 750 x 450, 800 x 300, 1000 x 300, 1000 x 450 mm, seamless

Thickness: 2 - 10 mm

other sizes (weldments and cuts) upon request

- **Tubes**

seamless and as weldment – dimensions upon request


- **Discs and shaped parts**

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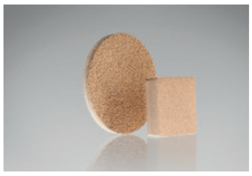


- **Fluidization units**

Fluidization bottoms according to customer specification

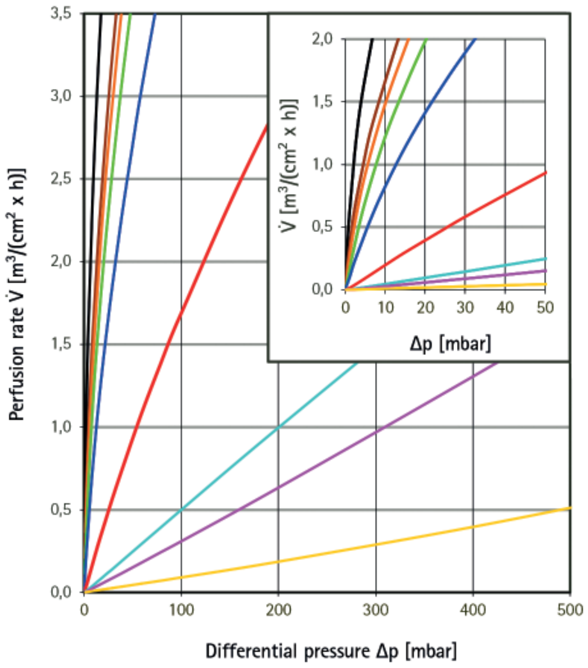

- **Filter cartridges**

seamless and as weldment – dimensions upon request

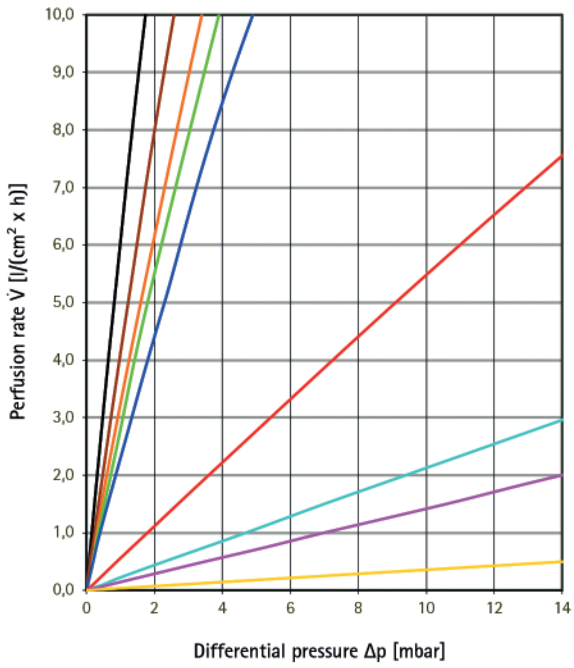

Permeability according to DIN ISO 4022

measured on discs (Ø80 x 3 mm) / surface area perfused: 20 cm² / correspond to 1 mm material thickness

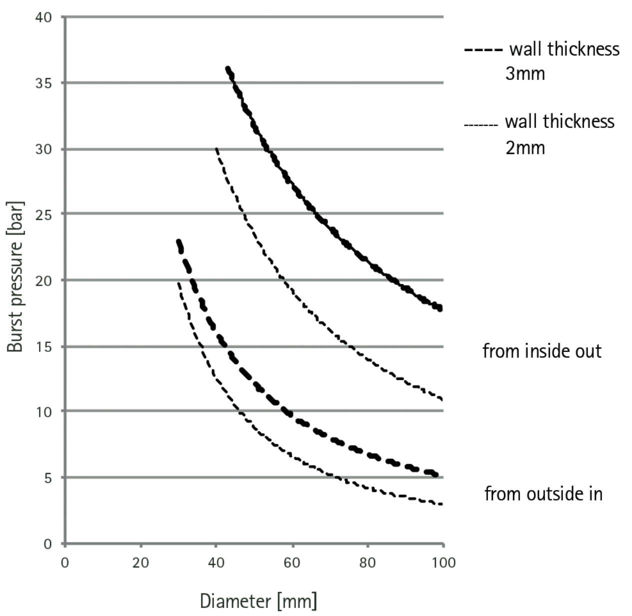
Air at 20 °C

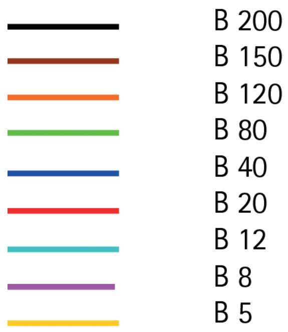


Water at 20 °C



Bursting strength of tubes





Technical data

Bronze CuSn 10

Temperature resistance: 200 °C oxidizing atmosphere / 350 °C reducing atmosphere

Filter grade	Density	Porosity	Specific flow coefficient		Separation efficiency (liquid) 98 %	Porometer ø pore size	Bubble Point Pressure difference	Shear strength	Tensile strength	Bending strength		
	[g/cm³]	[%]	laminar [m²] x10⁻¹²	turbulent [m] x10⁻⁷	[µm]	[µm]	[Pa]	[N/mm²]	[N/mm²]	δ el [N/mm²]	δ 0,1 [N/mm²]	δ Breakage [N/mm²]
B 5	6,0 - 6,4	27 - 32	1	1,5	12	3	5225	200	120	60	80	200
B 8	5,7 - 6,1	31 - 35	4	16	19	6	2425	170	105	60	70	150
B 12	5,1 - 5,9	33 - 38	6	35	28	9	1725	150	100	40	40	130
B 20	5,4 - 5,8	34 - 39	16	54	42	18	1125	140	65	25	30	90
B 40	5,2 - 5,6	36 - 41	65	120	75	34	625	110	30	15	25	40
B 80	5,0 - 5,4	39 - 43	80	200	131	55	525	90	25	15	20	35
B 120	4,9 - 5,3	40 - 44	90	250	225	70	325	80	20	10	10	25
B 150	4,7 - 5,1	42 - 47	120	300	251	90	225	60	10	10	10	25
B 200	4,5 - 4,9	44 - 49	180	400	301	105	125	40	5	5	5	10
	EN ISO 2738	*DIN ISO 30911-3*	*DIN ISO 4022*		*according to ISO 4572*	*ASTM E1294*	*DIN ISO 4003*	*DIN ISO 30911-6*	*according to EN ISO 2740*	*according to DIN ISO 3325*		

All stated values are mean values; the single values can differ according to the dimensions of the components.

Machining instructions

Turning	Tool shape:	Pointed finishing or side tool
	Hard metal grades:	ISO / ANSI K 20
	Effective cutting angle:	10°
	Clearance angle:	10°
	Depth of cut:	0.5 mm
	Cutting speed:	100 – 300 m/min
Welding	Porous sintered materials are welded by TIG. The material must be free from dirt and grease. The welding speed must be as high as possible to achieve optimal reduction of heat influx into the material.	
	Filler material:	Bronze wire CuSn 9 or CuSn 10
	Inert gas flow:	5 l/min
	Electrode diameter:	1.5 – 3 mm
	Current strength:	70 – 120 A

Machining

SIPERM® B can be rolled, bent, pressed, stamped, milled, turned or drilled, either cold after gentle heating. SIPERM® B 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 – water jet cutting and electrical discharge machining is, however, possible. When scrolling or bending SIPERM® B plates, it should be noted that the minimum bending radius is dependent on pore size and the material´s strength. Generally, however, the radius should not be less than 10 times the wall thickness.

SIPERM® B 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.

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Mechanical cleaning

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Also possible is the back-blowing with a hot steam, for instance for vapor degreasing with a steam cleaner.

The cleaning effect in counterflow can be supported by gently brushing with a soft brush (nylon brush). It is recommended to carry out this process simultaneously with the passage of the counterflow-medium in order to prevent further accumulation.

For smaller, removable filter parts, the ultrasonic cleaning by the resonance method is possible.

Chemical cleaning

The choice of the suitable solvent as well as the success of the cleaning process depends on the nature of the impurity. Therefore, recommendations can only be very general.

For the cleaning of SIPERM® B the following media can be used:

- All standard solvents such as benzene, carbon tetrachloride, alcohol, acetone
- Acetic acid up to 25 % (30 - 60 min) or 20 % (1 - 2 h)
- Hydrochloric acid up to 10 % (30 - 60 min)
- Alkali- and alkaline earth metal solutions

After dissolving and flushing out the impurities, the neutralization with hot water is advisable, and if necessary, a potassium-dichromatepickling, followed by thorough rinsing.

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 porous sintered material has a vastly increased surface area and thus is far more susceptible to any aggressive cleaning medium. For this reason, the cleaning time and cleaning temperature must not exceed the absolutely necessary level.

Depending on the application it must be ensured that the highly porous sintered parts are dried thoroughly after cleaning. Cleaning with solvents in any case requires a complete drying of the porous sintered component before reuse. Solvents should under no circumstances be used for the cleaning of sintered components, which operate in systems where, for safety reasons, the use or insertion of solvents is prohibited.

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Material SIPERM® HP

HP

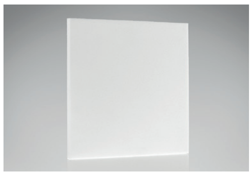
Polyethylene / PE-UHMW / HDPE
Temperature resistance: approx. 70 °C oxidizing atmosphere

Product overview

- **Plates**

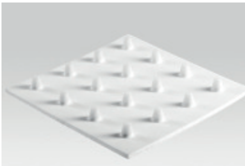
Size: 1000 x 1000 mm and 1200 x 1000 mm; Thickness: 3 - 20 mm
other sizes (weldments and cuts) upon request



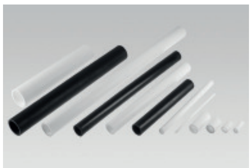
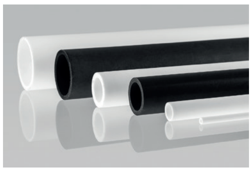
- **Cam plates**

Size: 850 x 850 mm; Thickness: 5 - 8 mm
Sintered spacer cams make an additional support redundant.




- **Tubes**

seamless and as weldment – dimensions upon request

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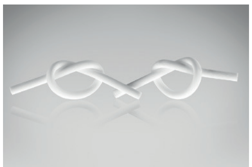
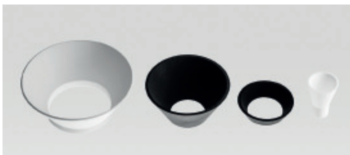


- **Fluidization units**

seamless fluidization bottoms – dimensions upon request
welded fluidization bottoms according to customer specification



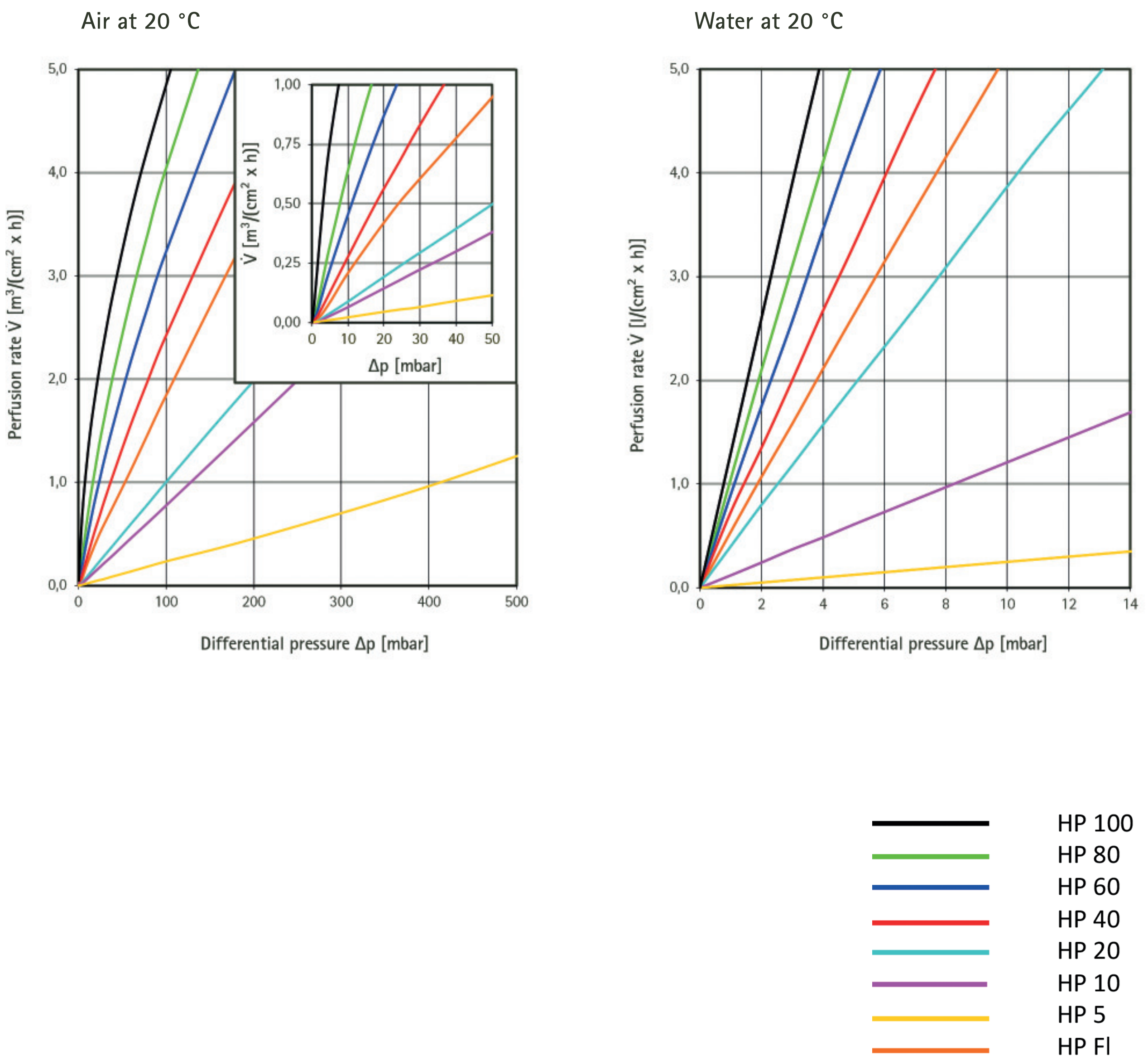



- **Filter cartridges**

seamless and as weldment – dimensions upon request

Permeability according to DIN ISO 4022

measured on discs (Ø80 x 5,7 mm) / surface area perfused: 20 cm² / correspond to 1 mm material thickness



Technical data

Polyethylene / PE-UHMW / HDPE
Temperature resistance: approx. 70 °C oxidizing atmosphere

Filter grade	Density	Porosity	Specific flow coefficient		Porometer ø pore size	Bubble Point Pressure difference	Shear strength	Tensile strength	Elongation
	[g/cm³]	[%]	laminar [m²] x10⁻¹²	turbulent [m] x10⁻⁷	[µm]	[Pa]	[N/mm²]	[N/mm²]	[%]
HP FI i	0,58 - 0,62	35 - 39	12	100	22	825	12	8	35
HP 5	0,56 - 0,62	35 - 39	0,7	6,5	7	3551	10	4	50
HP 10	0,56 - 0,60	37 - 41	3,4	20	12	1825	8	4	30
HP 20	0,53 - 0,57	40 - 44	11	51	18	1075	9	5	40
HP 40	0,51 - 0,55	42 - 46	19	60	35	425	6	4	20
HP 60	0,54 - 0,61	36 - 43	23	72	62	210	7	5	16
HP 80	0,46 - 0,54	43 - 52	30	80	78	125	7	5	15
HP 100	0,41 - 0,47	52 - 57	48	101	97	105	6	5	12
HP antistatic i	0,49 - 0,53	44 - 48	15	55	22	775	4	3	15
HP FI-R i	0,58 - 0,62	35 - 39	12	100	22	825	12	7	35
	EN ISO 2738	*DIN ISO 30911-3*	*DIN ISO 4022*		*ASTM E1294*	*DIN ISO 4003*	*DIN ISO 30911-6*	*according to EN ISO 2740*	*according to DIN ISO 3325*

All stated values are mean values; the single values can differ according to the dimensions of the components.

i

HP FI – Standard plate material for fluidization
HP antistatic – Standard material antistatic; Surface resistivity <10^6 Ohm / All other HP grades are also available in antistatic version.
HP FI-R – Stainless steel infiltrated standard plate material for fluidization. The material is detectable and therefore suitable for use in the food industry.

Machining instructions

Turning	Tool shape:	Pointed finishing or side tool
	Effective cutting angle:	5 - 30°
	Clearance angle:	10 - 15°
	Depth of cut:	0.1 - 0.5 mm
	Cutting speed:	200 – 500 m/min
Welding	Hot gas and heated tool welding	
	Filler material:	Polyethylene wire (Natural PE)
	Electrode diameter:	3 – 5 mm
	Welding temperature:	200 – 250 °C

Machining

SIPERM® HP can be rolled, bent, pressed, stamped, milled, turned or drilled, either cold after gentle heating. SIPERM® HP 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 – water jet cutting and electrical discharge machining is, however, possible. When scrolling or bending SIPERM® HP plates, it should be noted that the minimum bending radius is dependent on pore size and the material´s strength. Generally, however, the radius should not be less than 10 times the wall thickness.

SIPERM® HP 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.

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Cleaning instructions

When all impurities are retained on the surface of the filter element without the penetration of particles into the pore channels, mechanical cleaning is usually sufficient. The counterflow cleaning is not sufficient when impurities have solidified inside the filter. Then we recommend the chemical dissolution of the residue in solvents which do not attack the filter.

Mechanical cleaning

This can easily be done by reverse washing (back-flushing) in a clean liquid or gas without disassembling the SIPERM®-component. The medium used for the reverse-washing process may either be the filtrate itself or the medium which is flowing through the SIPERM®-component. It is however recommended to work with a gas counter-flow, if the filtrate is a gas, or with a liquid counterflow, if it is a liquid filtrate. If very dirty, the cleaning process is more thorough, the more often it is repeated.

Also possible is the back-blowing with a hot steam, for instance for vapor degreasing with a steam cleaner.

The cleaning effect in counterflow can be supported by gently brushing with a soft brush (nylon brush). It is recommended to carry out this process simultaneously with the passage of the counterflow-medium in order to prevent further accumulation.

For smaller, removable filter parts, the ultrasonic cleaning by the resonance method is possible.

Chemical cleaning

The choice of the suitable solvent as well as the success of the cleaning process depends on the nature of the impurity. Therefore, recommendations can only be very general.

For the cleaning of SIPERM® HP the following media can be used:

- Solvents: acetone, ethanol, methanol, benzine (RT)
- Acetic acid 10 %
- Hydrofluoric acid 40 %
- Hydrochloric acid (any concentration)
- Nitric acid 25 %
- Sodium hydroxide solution

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 porous sintered material has a vastly increased surface area and thus is far more susceptible to any aggressive cleaning medium. For this reason, the cleaning time and cleaning temperature must not exceed the absolutely necessary level.

Depending on the application it must be ensured that the highly porous sintered parts are dried thoroughly after cleaning. Cleaning with solvents in any case requires a complete drying of the porous sintered component before reuse. Solvents should under no circumstances be used for the cleaning of sintered components, which operate in systems where, for safety reasons, the use or insertion of solvents is prohibited.

Please note that when cleaning SIPERM® HP with surfactants, the material loses its hydrophobic property.
Moreover, surfactants reduce the material's resistance to cracking.

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Fluidization of bulk materials with SIPERM® aeration components

Storage, mixing and discharge of bulk materials with average particle sizes of less than 0.2 mm frequently causes problems because these bulk materials do not flow freely and therefore are almost impossible to discharge. They tend to agglomerate and form bridges and tunnels, particularly around the silo outlet, thereby obstructing the free flow of the material from the storage vessel.
Such low flowable materials include fine plastic powders, flour, pigments, soot, cement, pesticides etc.

The solution to the problems of discharging bulk materials

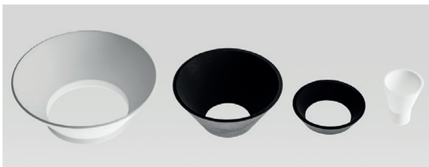
A proven solution for the problem-free handling of bulk solids with average grain sizes between 10 and 200 µm is the fluidization of the material using pneumatic aeration units made from highly porous SIPERM® materials.

You can choose between:

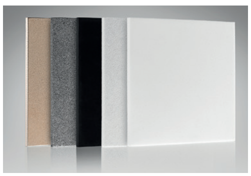
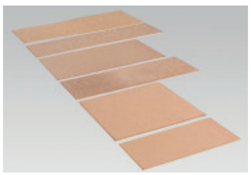
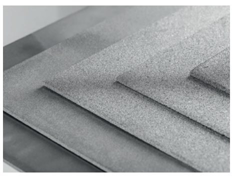
- Custom-made aeration bottoms, cones or inserts which we manufacture to your specifications

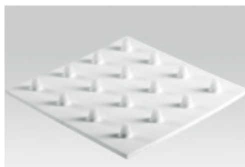






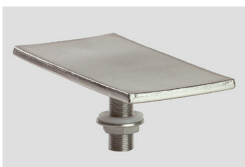
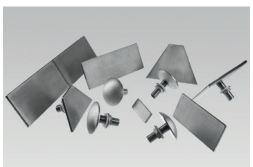

- Plate material for adapting to your own systems



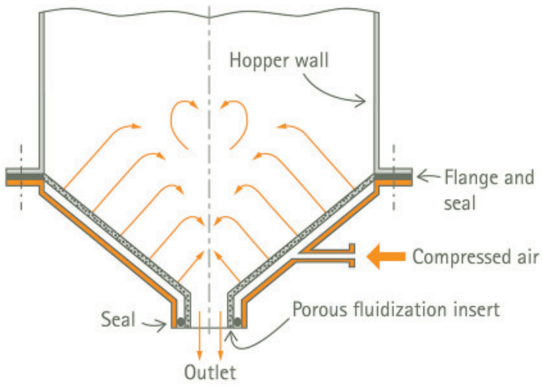
- Standard aeration pads which can easily be retrofitted into existing systems

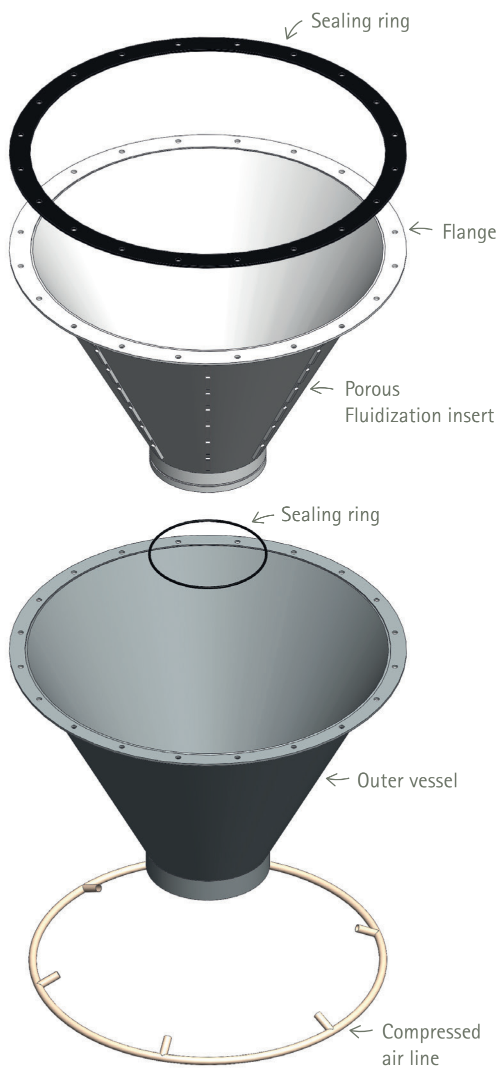



Fluidization inserts made of SIPERM®

The operating principle of the fluidization inserts made of SIPERM® is shown in the graphic below.





Installation fluidization insert

Dry, dust-free air is injected to reduce the friction and cohesive forces of the bulk material, producing a continuous flow of the material from the vessel. Air supply pressure and velocity of air must be set at such a rate that the contents of the silo are evenly loosened.

When fitting-out large silo areas with aeration units, it is advantageous to divide them into sectors each of which can be interchangeably aerated. The sectors can be arranged in a radial pattern or laid out concentrically starting from an inner ring. In this way it is possible to aerate even large areas with relatively low air quantities. In many cases it is sufficient to compensate the pressures produced by the bulk material during storage by the inflowing air.

The support of the fluidization insert is usually realized with supporting ribs. Depending on the material and system conditions, these are either welded to the side of the fluidization insert away from the product, or attached to the inside of the solid outer vessel.

Operating notes

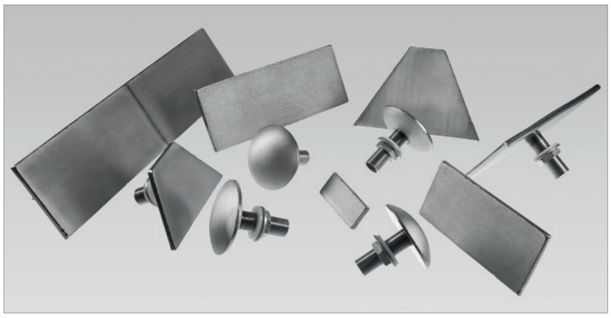
Fluidization cones: The medium (e.g., air, nitrogen, etc.) used for the operation must be dry and free from dirt and grease/oil. The required gas quantities depend on the respective application (ventilation, fluidization, homogenization or drying), the plant dimensions and the bulk material properties. For applications for discharge improvement in fully lined bins, the typical gas amounts needed are 100-300 $m^3/(m^2*h)$.

In the case of partial linings with fluidization pads or applications for drying or homogenization, the gas quantities may be correspondingly higher. The pressure loss is dependent on the porous material used and the material thickness, the size of the surface to be ventilated, the amount of gas supplied and the dimensions of certain components of the compressed air system (pipe diameter, pipeline management, etc.).

Ready-to-install aeration components made of SIPERM®

Ready-to-install aeration components made of SIPERM® can also be retrofitted in hard-to-reach places in silos as well as in other existing systems. They are supplied complete with all the necessary hardware, such as seal, washer and nut.

In addition to our various standard aeration components, we also produce customized components on request.



Standard aeration components

Item number	180082	180047	180131	180125	182525
Dimensions	125 x 250 mm	125 x 500 mm	ø100	ø105	ø80
Connection	G 3/4"	G 3/4"	G 3/4"	G 3/4"	G 1/2"
Porous material	AISI 316L	AISI 316L	AISI 316L	AISI 316L	AISI 316L
Solid material	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304
SIPERM® grade	R	R	R 14	R 14	R
					

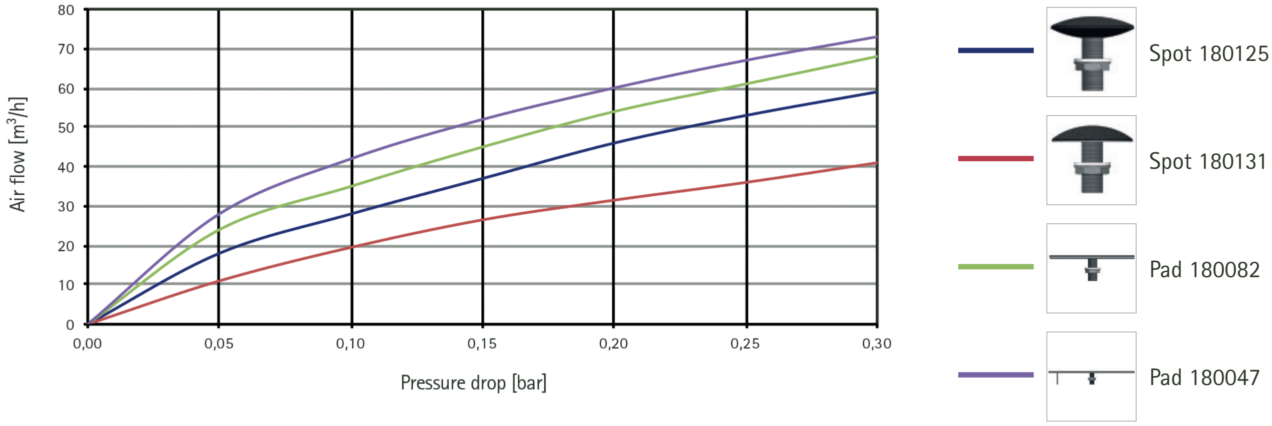
Information on the flow behavior of our ready-to-install aeration components can be found on the back page.

Operating notes

Spots: Air consumption depends on type and overall size. For the round spots for example it is approximately 10 m^3/h at a pressure of 50 mbar.

Regular maintenance of the SIPERM® Ready-to-install aeration components is not necessary. The porous SIPERM® materials can be cleaned dry or wet, depending on the bulk materials used and product changes within the plants. The respective suitable cleaning process depends both on the installation as well as on the bulk materials used and on the porous material used. In any case, complete drying of the porous material should be ensured before re-use.

Permeability measured on R 14



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Deaerating and compacting bulk solids using SIPERM® materials

Fine-grained bulk materials such as colouring pigments, manganese dioxide, soot, cement, coal dust, various ceramic powders, powders for the food industry, pesticides and many other materials are very difficult to handle. They have a very large bulk volume, i.e. a very low bulk density, and produce large amounts of dust when transferred. In these cases compaction of powders is aimed at.

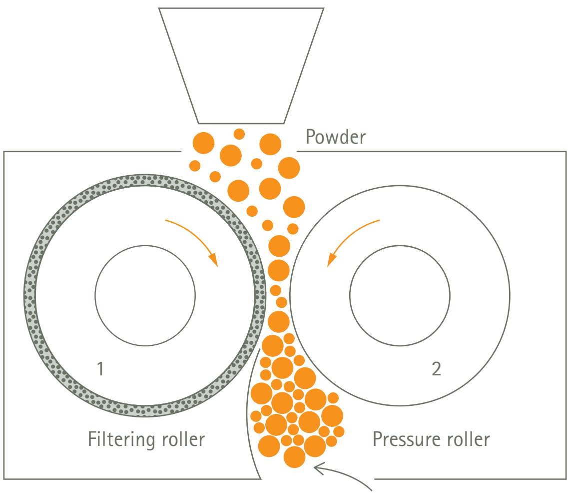
The solution: Vacuum compaction rollers and suction pipes

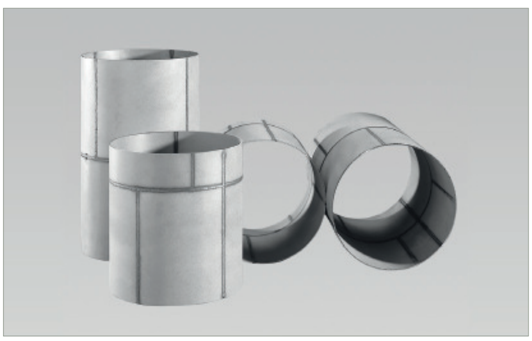
Such fine-grained bulk materials can be compacted down to 20 % of their bulk volume using vacuum compaction rollers or suction pipes made from SIPERM® materials. A distinction is made between two processes:

- **Compaction by means of vacuum compaction rollers**

The powder is compacted through a combination of mechanical pressure and vacuum. Normally, a filtering roller (1) and a pressure roller (2) run against each other. The powder is dispersed between the two rollers and sucked up and pre-compacted by the vacuum roller. The resulting filter cake is then compacted in the gap between the two rollers at a preset pressure. The compacted product is removed from the roller with a stripper and drops into the collecting vessel.

Vacuum compaction rollers are covered with SIPERM® R. The highly porous material is characterized by high compressive strength, temperature stability and chemical resistance, and is, therefore, suitable for a wide range of applications. The highly porous SIPERM® material used for covering the compaction rollers is available in sheet form and can be welded to create larger units and adapted by rolling to the radius of the roller body. This can either be done by the customer himself or by Tridelta Siperm GmbH.





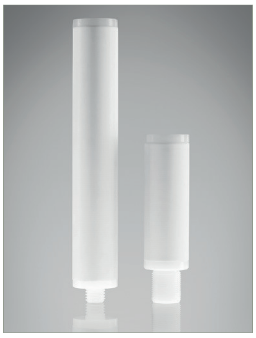
Coverings for compaction rollers made of SIPERM® R

Volume reduction by means of suction pipes

Suction pipes made from SIPERM® are suitable for reducing the volume of bulk materials in bags or vessels. These pipes are dipped in the bulk material to be compacted, either during or after the filling process. By sucking the excess air, the filling volume of the bulk material in the container is significantly reduced.

Depending on application, different materials and filtration grades are used. We supply seamless pipes made from stainless steel, bronze or polyethylene.

Suction pipes made of SIPERM® R and SIPERM® B



SIPERM® HP

SIPERM® R

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Filtration with SIPERM®

Particulate residues in gases or liquids can lead to contamination in many applications. These pollutants hinder the desired processes or do not comply with legal regulations on environmental protection. In other cases, particles are to be recovered from a medium stream for economic reasons.

Applications for filter materials made from SIPERM®

Filtration is a fundamental procedure in many manufacturing processes. Porous sinter materials are ideally suited for filter functions in various applications.

Depending on the application, filter materials made from Stainless steel (SIPERM® R), Bronze (SIPERM® B) or Polyethylene (SIPERM® HP) are used. The SIPERM® materials consist of powders, which are melded to porous bodies by sintering. Depending on the powder particle size of the starting material, different porosities and filter fineness can be realized. The manufacturing process allows almost any geometry.

The selection of the appropriate SIPERM® material depends on the application temperature, the materials to be filtered, as well as the pressure loss and the deposition rate. Depending on the application, it is possible to choose from a large number of different pore size distributions in order to achieve the best possible filtration result.

Stainless steel filters – SIPERM® R (AISI 316 L / 1.4404)
Pore size 1 – 200 µm

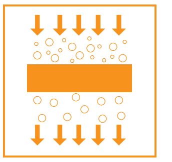
- High chemical resistance
- Even at high temperatures mechanically extremely resilient and dimensionally stable
- Food-safe
- Suitable for back-flushing and other cleaning processes

Application examples:

- Filtration of viscous plastic melts
- Filter cartridges for gas filtration in chemical processes
- Dust removal in measuring devices and electrical systems

Stainless steel filters - SIPERM® R (Pore size 1 - 200 µm)

Filtration with SIPERM®



Plastic filters – SIPERM® HP (PE)
Pore size 5 – 200 µm

- Very high chemical resistance
- Mechanically very stable, in particular also with changing load
- Realizable in complex geometry and high quantity
- Food-safe, with FDA-certificate
- Hydrophobic; hydrophilic adjustable

Plastic filters - SIPERM® HP (Pore size 5 - 200 µm)

Application examples:

- Dust removal, e.g. in automotive industry or valve technology
- Filter heads for humidity sensors
- Base material for dimensionally stable activated carbon filters

---

Bronze filters – SIPERM® B (CuSn 10)
Pore size 5 – 200 µm

- Low pressure losses
- Very homogeneous pore structure due to almost fully spherical base material

Bronze filters - SIPERM® B (Pore size 5 - 200 µm)

Application examples:

- Oil filters for hydraulic brake systems
- Gas filters in compressed air equipment

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Silencers made of
SIPERM® materials

Pneumatically operated machines such as compressed air motors, compressed air cylinders, pneumatic control units and pneumatic valves cause considerable noise due to effluent air which exits the devices at high speed. An accumulation of such facilities can lead to annoyance and, in the long run, damage to health of people working in this area.

The solution: Reduction of the sound emission

In the above-mentioned cases and in case of continuous air release as in air motors and explosively released air as in pistons, silencers made of SIPERM® provide an effective way to reduce the noise significantly.

Due to their long, tortuous pore channels, SIPERM® materials achieve excellent sound reduction. In the pores, the air flow is strongly swirled, the direction of flow is split and the air flow is slowed down. While the flow speed is slowing down, the sound energy is converted to frictional heat and part of the sound wave energy is absorbed by the porous body (absorption attenuation).

With conventional SIPERM® silencers, the total sound insulation effect is up to 20 dB (A).

- **Bronze silencers made of SIPERM® B**

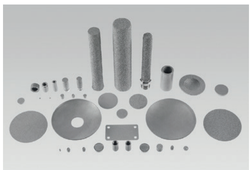
  Silencers made of porous bronze are available in various standard versions with thread. The material provides high resistance against petrol, all kinds of oils and e.g. carbonic acid. In oxidative gases such as air, silencers can be used up to 180°C.

- **Polyethylene silencers made of SIPERM® HP**

  Silencers made of porous polyethylene are available in various geometries. Dimensions, designs and quantities can be manufactured according to customer requirements. If necessary, the silencers can be mechanically reworked or welded. This material is advantageous due to its high chemical resistance, elasticity and low weight.

- **Stainless steel silencers made of SIPERM® R**

  Silencers made of porous stainless steel have proven their worth for special challenges regarding temperature (up to 500°C), corrosion and strength. In this case as well, we manufacture customized solutions according to your drawings, e.g. with threaded connection, which can be ideally adjusted to your requirements.



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Sensor protection with SIPERM® materials

Devices for the qualitative and quantitative measurement of gases or humidity are usually equipped with highly sensitive measurement sensors. To ensure the functionality of the measuring devices, these sensors have to be protected against soiling and mechanical damage. With explosive gas mixtures, the environment must be additionally protected against ignition sources caused by the measuring device.

The solution for the protection of gas measurement sensors

Porous materials made of stainless steel (SIPERM® R) and polyethylene (SIPERM® HP) are frequently used to protect measurement sensors in devices for the qualitative and quantitative measurement of gases or humidity. The measuring devices benefit in several ways from the effects of these porous materials.

- **Stabilized and homogeneous gas flow:**
  SIPERM® materials have a homogeneous pore distribution which effects a uniform diffusion of the gases to be detected through the sinter filter and thus protects the often highly sensitive measurement sensors against significant fluctuations.
- **Protection against soiling and mechanical damage:**
  The particles present in the gas stream are retained by the filter effect. At the same time, the sensor is protected against impact and shock loads.
- **Flame arrester (stainless steel only):**
  Protection against flashback during the detection of explosive and flammable gases.

The properties of our porous materials can be perfectly adjusted to the functions of the measuring devices. By targeted and precise adjustment of the material porosity, an optimal synergy between the response speed of the measuring sensor and the protection of the measuring head against soiling or flame flashback can be found.

For the connection of the porous material with the measuring device various solutions are available. Porous geometries made of stainless steel are often pressed in or on the corresponding solid connecting parts such as threads, flanges or housing using a suitable pressing tool and then are sintered together. Particularly at the interfaces between porous and non-porous materials stable chemical compounds are formed in the sintering process, which lead to a high mechanical strength of the components. Sensor units which are manufactured in this way can be directly screwed to the measuring device. Assembly faults, which can occur with other connection methods such as welding, glueing or clamping are hereby avoided.

With sensor protection heads made of porous polyethylene (SIPERM® HP) other properties are in the foreground. Thus, the inherently hydrophobic PE provides moisture-sensitive sensors with reliable protection against humidity. In the opposite case, when the material is hydrophilized, it can be used to protect moisture measuring sensors in soil analysis.

Protective caps for sensors made of SIPERM® R

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Calculation basis for
SIPERM® materials

Δp

The volume flow of a medium through a filter depends on the existing pressure difference and increases up to a maximum value which is reached asymptotically. The permeability measurement is usually performed in accordance with DIN ISO 4022 using gases. The measured values include the pressure difference Δp upstream and downstream of the filter and the flow rate at constant pressure and temperature. Filter surface and filter thickness are also constant in this test set-up so that the filter material coefficients can be determined based on the test curves.

Permeability / Volume flow / Pressure drop

To estimate the pressure drop for a given volume flow, Darcy's equation is to be used which illustrates the relationship in a simplified manner:

$$\Delta p = \frac{\dot{V} \cdot s \cdot \eta}{A \cdot \alpha}$$

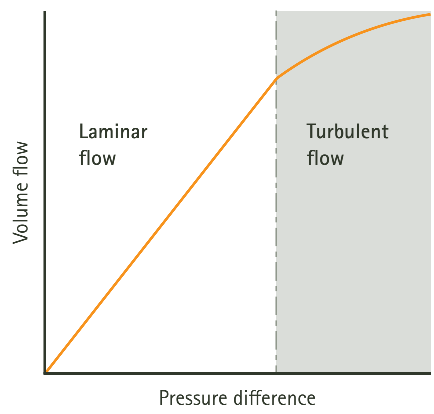
- Δp = pressure drop in the filter [N/m^2]
- $\dot{V}$ = volume flow (average volume of the flowing medium) [m^3/s]
- s = thickness of the filter [m]
- A = flow-through cross section of the filter [m^2]
- η = average dynamic viscosity of the flowing medium [Ns/m^2]
- α = specific laminar permeability coefficient [m^2]

This formula applies to low flow velocities if there is only a laminar flow. At higher pressure differences and higher flow velocities, the relation between pressure drop and volume flow is no longer linear but can be divided into a laminar and a turbulent proportion. This, however, only applies to very high Reynolds numbers.

$$\Delta p = \frac{\dot{V} \cdot s}{A} \cdot \left[\frac{\eta}{\alpha} + \frac{\rho}{\beta} \cdot \frac{\dot{V}}{A} \right]$$

- β = specific turbulent permeability coefficient [m]
- ρ = average density of the flowing medium [kg/m^3]

Specific permeability



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Quality standards of SIPERM® products

Only by applying comprehensive and reliable quality assurance measures at all levels ensures the product and service quality demanded by customers. Our efforts in pursuing this object have secured us DIN EN ISO 9001:2015 certification.

Quality assurance

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

- Bubble-Point-Test (according to DIN ISO 4003) for determination of maximum pore size
- Permeability Test (according to DIN ISO 4022) for determination of specific permeability
- Electronically controlled testing of admission pressure, differential pressure, flow rate
- Porometer measurements (according to ASTM F 316-03) for determination of pore size distribution
- Determination of filter separating capacity ratings – support by independent institutes assays
- Determination of the tensile and shearing strength (according to DIN 30910, Part 2)
- Customized measurements

Energy management

We are certified according to ISO 50001.

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