

# YOUR BEST SOLUTIONS FOR YOUR CUSTOMERS AND OUR EARTH

**WORLD'S UNIQUE COMPONENTS**  
for technical and decorative applications  
made of open-cell cast aluminum

**lighter. smaller. smarter. better.**

**more sustainable**

Innovative alternative for sintered metals, metal mesh, open-pore ceramics, wire windings and many more



**UP TO** 70% lighter  
40% smaller  
50% cheaper

**AND BETTER**  
Function  
Design Mounting  
System  
Integration  
Multifunctionality  
Hybrid parts  
Mechanical load  
Dynamic load  
Thermal load  
Service life

**GAS/FLUID SILENCING**  
**GAS/FLUID FILTRATION**  
**GAS/FLUID SEPARATION**  
**GAS/FLUID DISTRIBUTION**  
**HEAT SINKS / EXCHANGER**  
**PNEUMATIC TRANSPORT**  
**FIRE / EXPLOSION PROTECTION**  
**DUST / SPLASH PROTECTION**  
**SCHOCK ABSORPTION**  
**TOOLS & MACHINE PARTS**  
**ARCHITECTURE & DESIGN**

## OUR OFFER

Quick potential forecast. Feasibility study. Product development. Manufacturing.

### TO HEAVYWEIGHTS



### TO ASSEMBLIES



### SAY NO!



### TO CERAMICS



### TO SINTERED METALS



## THE SPECIAL KNOWLEDGE IS THE KEY TO SUCCESS

The new lightweight material class – open-cell cast aluminum – fundamentally differs from conventional aluminum foams, sintered metals, and 3D-printed structures.

With hundreds of material variants, it offers tailored properties and multifunctionality depending on the application. However, technical dependencies are complex and non-linear.

The feasibility, functionality, and cost-effectiveness of each solution are influenced by numerous factors, including application requirements, alloy selection, material structure, cell size and morphology, component geometry, thickness, volume, functional integration and much more.

Due to the unique manufacturing process and the potential for new functions, designs, and integrations, conventional economic evaluation methods are inadequate. Traditional assessments fail to capture the full benefits and systemic impact of this technology. A comprehensive, system-level analysis is essential for a realistic cost-effectiveness evaluation.

The OPENPORE technology is particularly suitable for producing turned and milled parts but not for cast components like housings.

Prices depend on quantity, component size, and geometric complexity. With increasing production volume, costs for small turned parts decrease from the double-digit to the single-digit euro range, while large plates and blocks drop from the triple-digit to the double-digit euro range.

This document provides only a general overview. Without expert knowledge and application-specific consultation, misunderstandings and misinterpretations are inevitable.

We have invested many years of our decades-long experience in product development into building a unique technological ecosystem for researching new materials pre-developing numerous applications and enabling series manufacturing. Several of these solutions have been patented. Our expertise is globally unique.

Our focus is on multi-structural, multifunctional multi-material systems for a wide range of technological fields.

We support you in various project phases to differentiate your products through optimized weight, functionality, energy efficiency, resource utilization, and cost-effectiveness.

## APPLICATION EXAMPLES

**Pneumatics:** Alternative to the silencers of a global market leader – approx. **40%** smaller, **70%** lighter, quieter, and more cost-effective.

**Filtration:** Alternative to sintered metal filters – up to **48%** cost savings for a quantity of 1,000 pieces.

**Vacuum Technology:** Alternative to porous plastic – a solution for a handling problem in labeling machines of a global market leader, for which no solution previously existed.

**Electronics Cooling:** PORECOOL high-performance heat sink – up to **70%** lighter and more compact than conventional profile heat sinks.

OPENPORE aluminum offers potential for numerous applications and media, including **air, water, steam, oil, and polymers** – in areas such as: Hybrid components, lightweight construction, cooling, noise reduction, lubrication, filtration, separation, mixing, homogenization, distribution, capillarity, stiffness, vibration resistance, impact resistance, fire protection, and joining technology.

We would be happy to discuss possible applications with you. Schedule a callback appointment or contact us directly if you are interested.

## SOME CUSTOMERS OF METAHYBRID TECHNOLOGY ECOSYSTEM



## OUR OFFER

### 1. Telephone call (free of charge)

Your project, product, challenge and our possible support.

### 2. Quick Potential Assessment (free of charge)

NDA. Your product, challenges and goals. Our solution approaches and potential forecast. Next steps for feasibility study.

### 3. Feasibility study

Physical and / or digital prototypes. Validation. Optimization.

### 4. Product development

Final design. Procurement.

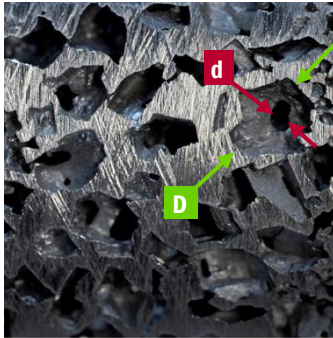
### 5. Manufacturing

EMPB. Ramp-up. Delivery.

For more informations and videos please visit our websites:

[www.openpore.com](http://www.openpore.com) [www.porecool.com](http://www.porecool.com) [www.automoteam.com](http://www.automoteam.com)

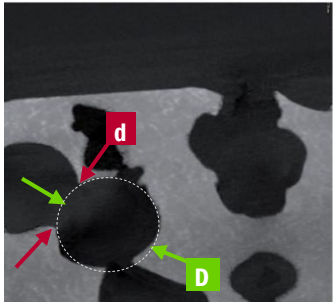
## NEW LIGHTWEIGHT MATERIAL CLASS



**Better material class for innovations in mechanical, pneumatic, hydraulic, acoustic, thermal, structural, electrical, energetic, and decorative applications.**

- light ( $0,8 - 1,3 \text{ g/cm}^3$ ), isotropic, resilient,
- unique pore morphology
- any pore size ( $D > 140 \mu\text{m}$ ,  $d > 10 \mu\text{m}$ ),
- homogeneous volume porosity  $55 \pm 5\%$ ,
- up to 20 times higher compressive strength vs. Al-foam,
- up to 8 times higher thermal conductivity vs. Al-foam,
- up to 3 times higher permeability for gases and fluids,
- up to  $250^\circ\text{C} - 400^\circ\text{C}$  working temperature,
- up to 5 dB higher efficiency of noise level decreasing,
- greater resistance to vibration and shock loads.

**... and much more**



## OVER 700 MATERIAL VARIANTS

Standard aluminum alloys.

The pore sizes can be freely adjusted using a combination of multimodal NaCl placeholders.



## MANUFACTURING PROCESS



1. Mold filling with salt (NaCl) granules.



2. Mold filling with Al melt.

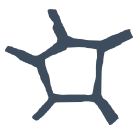


3. Conventional processing.



4. Rinse out the salt and done.

## NOVEL PORE MORPHOLOGY



Foamed metal



Sintered metal



Open-cell cast Al

Cast structure with isotropic, adjustable, reproducible properties. Different microstructure than with foamed or sintered materials with better mechanical, fluid mechanical, thermal, acoustic and other properties.

## Any shapes and sizes



## Any joining technologies



## Partial porosity



## Functional surfaces



## Multimaterial systems





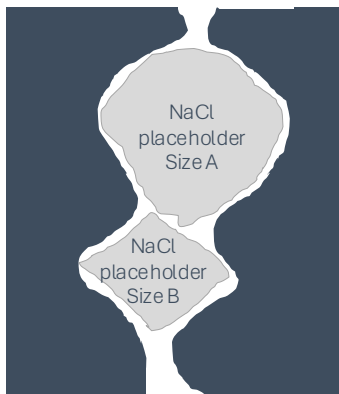
## PORE MORPHOLOGY

Different physical processes such as filtration, sound absorption, shock absorption or heat transfer require specific pore morphology settings.

The pore morphology can be set bimodal (2 sizes of NaCl placeholders) or tetramodal (4 sizes of NaCl placeholders).

The sizes of NaCl placeholders can be selected as required between 0,2 mm and 20 mm.

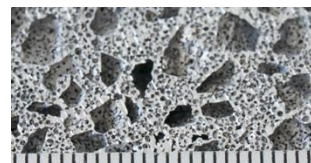
This means that hundreds different materials can be set for all possible applications.



Pore morphology of bimodal material

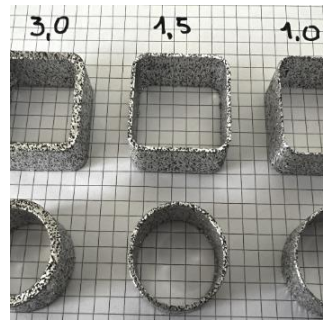


Bimodal 3, 0-5, 0 mm



Tetramodal 3, 0-5, 0-0, 40-0, 63 mm

## PROCESSING AND MACHINING



The material is generally very well suited for machining. Depending on product requirements, pore size, and component geometry, various shaping scenarios using conventional machining can be considered:

- machining of closed-cell cast semi-finished parts with embedded NaCl placeholders (best option),
- machining of open-cell finished parts without NaCl placeholders.

### CNC Machining

Open-cell aluminum castings can be processed using any type of CNC milling or turning machine. To prevent pore clogging, product-specific adjustments based on the following general guidelines are recommended:

- cooling with compressed air,
- sharp HSS or carbide tools with cutting angles suitable for aluminum,
- cutting speed: 500 – 1000 m/min,
- feed per tooth: 0.02 – 0.1 mm (the thinner the material, the smaller the feed rate).

Recommended spindle speeds for different cutter diameters (minimum speed = 5,000 rpm):

- D = 6 mm → 26.500 rpm,
- D = 8 mm → 19.900 rpm,
- D = 10 mm → 15.900 rpm,
- D = 12 mm → 13.300 rpm.

After machining, rinsing with water and drying is required.

### Grinding / Polishing

Mechanical surface finishing can be performed using conventional methods. The use of liquids or pastes is not recommended, as residues are difficult to remove from the pores.

### Cleaning

Water or aluminum-compatible cleaning agents can be used for cleaning. Contaminated components such as filters or silencers can be effectively cleaned using backflushing techniques.

### Bonding

The porous material can be bonded effectively without prior surface treatment. Recommended adhesives include:

- Kleiberit® 2K-PUR (573.8 Component A + 573.9 Component B)
- Kleiberit® 1K-PUR 566.0
- Agomet® F330

## JOINING TECHNOLOGIES

The material can be processed very well. The machining of open-cell aluminum castings can be carried out with any type of CNC milling or turning machine. For larger constructions, open-pore components can be assembled in the conventional way: press fits, tongue-and-groove joints, screws, rivets, welding, ultrasonic welding, soldering, gluing, etc.



## MULTIMATERIAL SYSTEMS AND FUNCTIONAL SURFACES

### INFILTRATION WITH POLYMERS AND MATERIAL BONDING.

#### Adjustable and strong

The PORECOL components can be infiltrated extremely well and media-tight with any polymers in any manufacturing process with a maximum process temperature of 400°C.



*Testing the bond strength of the composite with infiltrated PA6GF30 polymer into large and small pores (injection moulding process).*

The properties of the bond between aluminium and polymer can be adapted for many functional integrations using different parameters:

- air and water ducts,
- seals,
- vibration dampers,
- thermal insulation,
- fastenings.

### FUNCTIONAL SURFACES.

#### Advanced performance and multifunctionality

The surfaces of open-pored aluminium parts can be functionalised in different processes. Not only the outer but also the inner pores in the entire volume of the component are functionalised. As the open-pored components have an extremely large specific surface area in a small volume, different surface technologies reach their limits under different boundary conditions.

#### Anodic oxidation (anodising)

This process is suitable for components with larger pores that enable the safe removal of electrolytes. The surface properties correspond to conventional surface properties of anodised aluminium.

#### METAKER® Surface

METAKER® Surface is a new technology for powerful, multifunctional, micro-structured, chemically activated, graded micro-composite surfaces. The process is suitable for smaller components with pores of any size.

#### PEEK / PEKK coating systems

Coatings with high-performance polymers PEEK or PEKK are particularly suitable for applications where a combination of high corrosion resistance, scratch resistance, temperature resistance and diffusion resistance is required. The process is suitable for small and large components with small and large pores.

#### Other coating systems

Feasibility studies for other coating systems can be carried out on request.



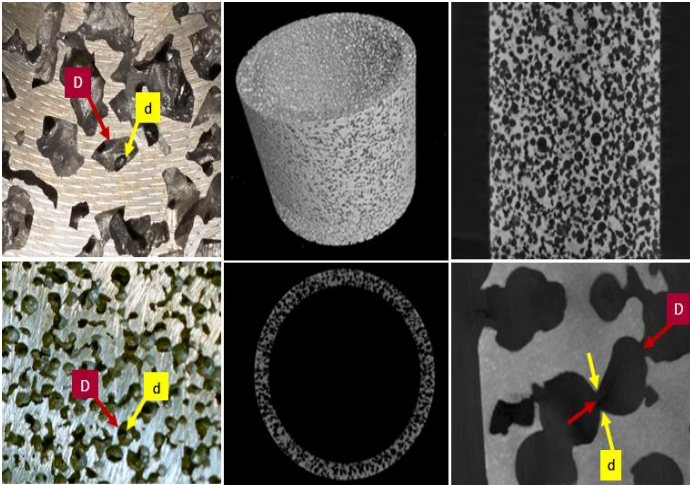
*Local functionalization with PA6GF30 polymer in the injection moulding process.*



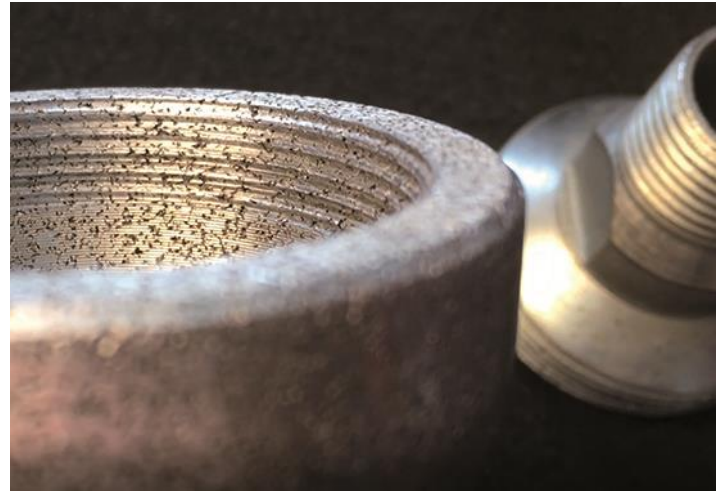
*Bushing made of open-cell AISi7 cast aluminum (top) with METAKER® Composites surface (left) and PVD coating (right).*



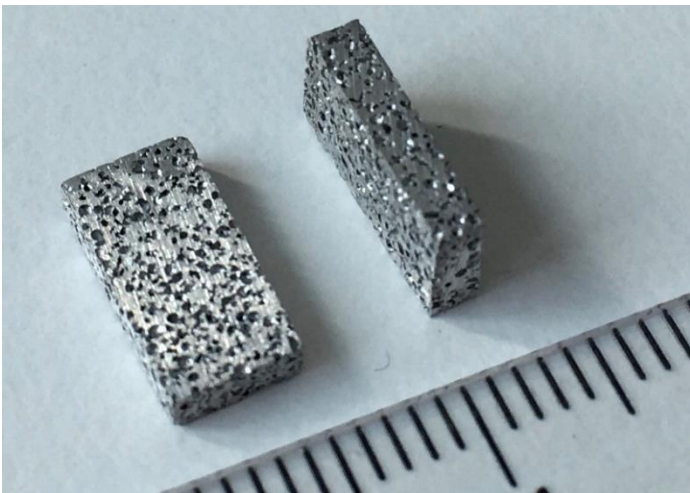
## NEW LIGHTWEIGHT COMPONENTS FOR VARIOUS APPLICATIONS



The cast structure is macroscopically isotropic. The pores can be adjusted in a wide range of sizes. Selectively porous components can be produced.



Resilient threaded connection between a completely open-pore cast part and a solid material socket.



The world's smallest, completely open-pore cast parts for use in electronics.



The geometry of the cast parts can be as complex as desired. The maximum possible component size depends on the application and geometry.

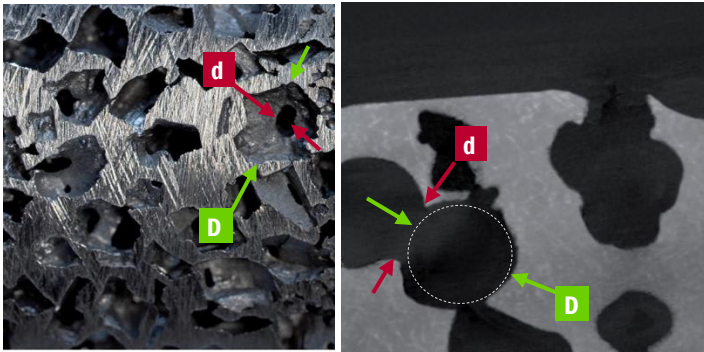


Series application: Compressed air silencers made of open-pore cast aluminum (below) are lighter, smaller, better, cheaper and more sustainable than conventional silencers made of different materials.



Enormous variety of possible architectures, designs and material settings as monomaterial hybrids and multimaterial systems for a wide range of applications.

## FILTERS



Filters made of open-cell cast aluminum has the numerous advantages over traditional filtration materials. The material has resilient cast structure, higher mechanical strength, higher volumetric porosity (about  $55 \pm 5\%$ ) that sintered parts and provide high permeability and longer life cycle.

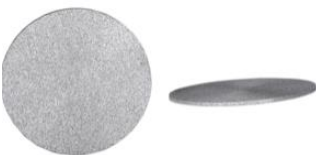
The adjustable small connection pores „d“ define the filter fineness ( $d_{\min} = 10 \mu\text{m}$ ). The adjustable large pores „D“ ( $D_{\min} = 140 \mu\text{m}$ ) ensure reliable dirt pickup and longer operating time without regeneration.

The regeneration of open-cell metals involves annealing and washing in solvents. With porous sintered metals, the impurities accumulate in the gaps between the sintered metal particles and are difficult to remove during regeneration, as a stagnant zone forms at the contact point between the individual metal particles when washing with solvents. Due to the special pore morphology, porous aluminum can be easily cleaned.

In direct comparison with sintered filters, filters made of porous aluminum offer better properties (example for wall thickness 5 mm, filtration fineness  $80 \mu\text{m}$ ):

- porosity +100%,
- permeability +733%,
- separation efficiency +20%,
- dirt absorption +164%.

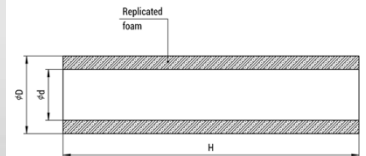
### FILTER FED



Filter elements in the form of discs are available for order with the diameter up to 650 mm.

If you would like to order please send us a request with designation of thickness, diameter and pore size.

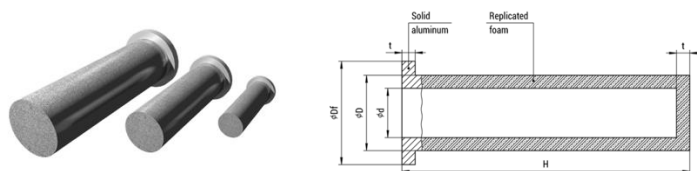
### FILTER FEC



Model	D, mm	d, mm	H, mm	Filtration surface, cm <sup>2</sup>
FEC 30-100	30	22	100	94,2
FEC 30-200	30	22	200	188,5
FEC 35-50	35	29,6	50	55,0
FEC 40-200	40	32	200	251,3
FEC 55-195	55	45	195	336,9
FEC 60-100	60	50	100	188,5
FEC 60-200	60	50	200	377,0
FEC 70-120	70	60	120	263,9
FEC 70-230	70	60	230	505,8
FEC 74-126	74	66	126	292,9
FEC 85-107	85	75	107	285,7
FEC 85-164	85	75	164	437,9
FEC 90-170	90	80	170	480,7
FEC 90-200	90	80	200	565,5
FEC 94-199	94	80	200	590,6
FEC 100-200	100	90	200	628,3
FEC 105-100	105	95	100	329,9
FEC 110-100	110	95	100	345,6
FEC 110-200	110	98	200	691,1
FEC 135-100	135	120	100	424,1
FEC 135-120	135	120	120	508,9
FEC 135-220	135	120	220	933,1
FEC 135-340	135	120	340	1442,0
FEC 135-440	135	120	440	1866,1
FEC 135-560	135	120	560	2375
FEC 135-1100	135	120	1100	4665,3
FEC 135-1225	135	120	1225	5195,4
FEC 150-370	150	135	370	1743,6
FEC 161-287	161	139	287	1451,6
FEC 170-270	170	160	270	1442,0
FEC 175-250	175	160	250	1374,4
FEC 190-400	190	175	400	2387,6
FEC 196-275	196	181	275	1693,3
FEC 220-290	220	205	290	2004,3
FEC 225-390	225	210	390	2756,7
FEC 280-550	280	265	550	4838,0
FEC 300-400	300	280	400	3769,9
FEC 360-1100	358	340	1100	12371,6

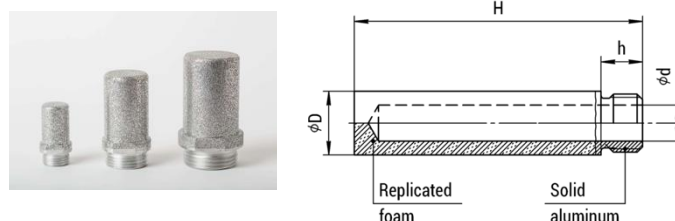
## FILTERS

### FILTER FEF



Model	Df, mm	D, mm	d, mm	H, mm	t, mm	Filtration surface, cm <sup>2</sup>
FEF-T50	50	40	30	200	5	263,9
FEF-T60	60	50	40	220	5	365,2
FEF-T70	70	55	40	220	7,5	403,9
FEF-T80	80	70	60	220	5	522,3
FEF-T100	100	90	77	225	11,5	699,8
FEF-T125	125	110	100	250	5	959,0

### FILTER FER



Model	D, mm	d, mm	L, mm	h, mm	Filtration surface, cm <sup>2</sup>
FER G1/8	10	4	40	7	8
FER G1/4	14	8	67	7	15
FER G3/8	17	9	80	10	32
FER G1/2	21	13	104	14	55
FER G3/4	27	17	125	16	85
FER G1	39	25	110	15	115
FER G1 1/2	52	36	190	15	230
FER G2	72	60	200	27	360

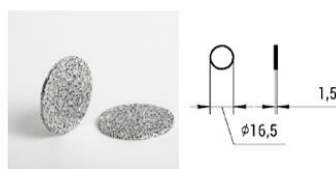
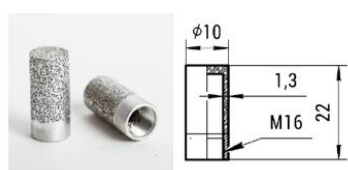
## PROTECTION CAPS FOR CO<sub>2</sub> SENSORS

### Innovative Solution for Protecting CO<sub>2</sub> and Other Sensors

Our material reliably shields sensors from dust and moisture while ensuring optimal gas permeability. Its properties can be tailored to specific applications to achieve the perfect balance between sensitivity and permeability.

### Your Benefits at a Glance:

- Minimal sensor delay for accurate measurements
- Wide temperature range for versatile applications
- Flexible material adaptation to operating conditions
- Customizable shape and size as required
- Cost-effective solution with high performance





## SILENCER

### Pneumatic Silencers – Efficient Noise Reduction and System Protection

Our pneumatic silencers reduce noise levels and enhance the maintenance of industrial automation systems. They not only minimize exhaust noise but also protect the drive system from dust and dirt particles that could enter through the valve.

### How Does a Pneumatic Silencer Work?

A silencer consists of an open-pored cast body that slows down and cools the flowing gases. This significantly reduces the noise of the exhaust air and minimizes the risk of spark formation. Thanks to its porous aluminum structure, the airflow can be flexibly adjusted, ensuring low resistance and minimal impact on the pneumatic system.

### Your Benefits at a Glance

Optimize your system with our high-quality pneumatic silencers. They are not only lighter, more compact, and more durable than conventional sintered metal silencers but also offer a more cost-effective and sustainable solution.

Below, we present a selection of our pneumatic silencers.

### General specifications

Material: Al99,5%, AlSi7Mg0,3

Operating medium: air, natural gas, steam

Operating temperature range: -60°C ... 250°C

Operating pressure: max. 25 bar

Efficiency of noise level decreasing is higher for 1 – 5 dB in comparing with sintered bronze.

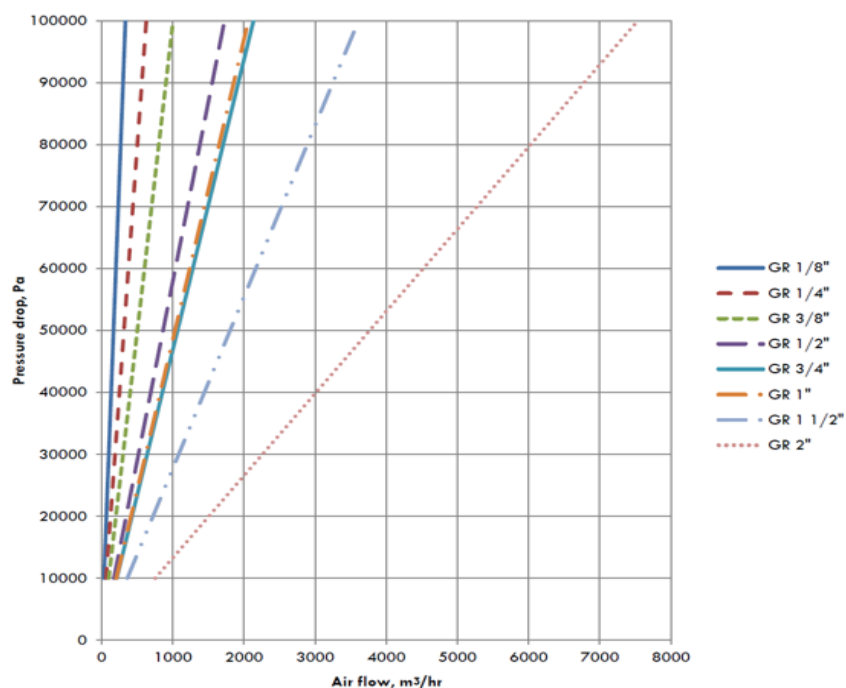
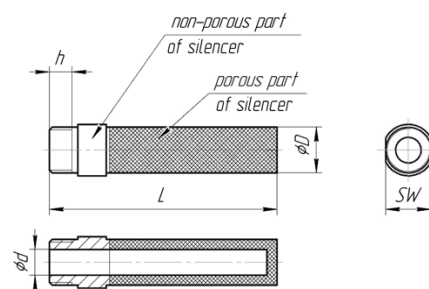
### Analogs (FESTO, Camozzi, SMC, Aventics)



## SILENCERTYPE GR

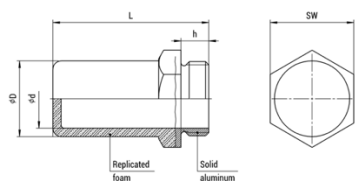


OPENPORE silencer is up to 40% smaller, 70% lighter than standard silencers on the market.



Model	Through put at a differential pressure of 0.5 bar, l/min	Working area, cm <sup>2</sup> , not less then	Reducing of sound pressure level, dB	Tubing thread DIN ISO 228	D, mm	L, mm	SW, mm	h, mm	d, mm
GR 1/8"	2775	8	20	K 1/8" or G 1/8"	10	40	10	7	4
GR 1/4"	5208	15	20	K 1/4" or G 1/4"	14	67	14	7	8
GR 3/8"	11041	32	20	K 3/8" or G 3/8"	17	80	17	10	9
GR 1/2"	14333	55	20	K 1/2" or G 1/2"	21	104	21	14	13
GR 3/4"	17708	85	20	K 3/4" or G 3/4"	27	125	27	16	17
GR 1"	17083	115	20	K 1" or G 1"	39	110	41	15	25
GR 1 1/2"	30087	230	20	K 1 1/2" or G 1 1/2"	52	190	55	15	36
GR 2"	62790	360	20	K 2" or G 2"	72	200	75	27	60

## SILENCER GR-SW

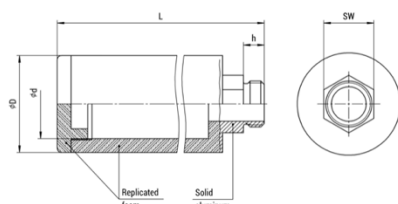
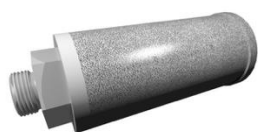


Model	Thread type	Thread size	D, mm	d, mm	L, mm	h, mm	SW	Air flow**, nl/min	SPL not more than, dB(A)	Exploitation temperature, °C	Analogue
GR-SW G1-8	G*	1/8"	10	6	21,5	4,5	13	1900	76	-60 - +250	Camozzi 2921 Camozzi 2931 FESTO AMTE AVENTICS SI1 SMC AN
GR-SW G1-4		1/4"	13	9	28	6	16	3115	78		
GR-SW G3-8		3/8"	17	12	36	7	19	4420	80		
GR-SW G1-2		1/2"	20	16	43,5	9	24	6650	81		
GR-SW G3-4		3/4"	27	21	56	10	30	12700	83		
GR-SW G1		1"	33	26	67	12	36	17900	85		

\* Other thread types available on request.

\*\* Measured at pressure drop between inlet and normal atmosphere 0,63 MPa

## HIGH PRESSURE SILENCER GR-SW-HP



Model	Thread type	Thread size	D, mm	d, mm	L, mm	h, mm	SW	Air flow**, nm <sup>3</sup> /min	SPL not more than, dB(A)	Exploitation temperature, °C	Analogue
GR-SW-HP G1-2	G*	1/2"	60	40	160	15	24	30,6	86	-60 - +250	Festo U-...-HD-SA SMC VCHN
GR-SW-HP G3-4		3/4"	60	40	160	15	30	30,6	86		
GR-SW-HP G1		1"	70	50	220	20	36	58,0	92		
GR-SW-HP G1 1-2		1 1/2"	70	50	220	20	50	58,0	92		
GR-SW-HP G2		2"	70	50	220	20	60	58,0	92		

\* Other thread types available on request.

\*\* Measured at pressure drop between inlet and normal atmosphere 5,0 MPa

## SPECIAL SILENCER FOR PNEUMATIC MOTORS, ENGINES, SCREWDRIVERS



Advantages of open-pore cast aluminum silencers in comparison with felt silencers:

- less noise level
- higher motor rotation speed
- high durability
- fewer components
- fewer different materials
- better CO<sub>2</sub> balance

Model	Air flow of motor, nm <sup>3</sup> /min	SPL not more than, dB(A)	Thread	Exploitation temperature, °C
M003, MD003, MP003	1,2	82	NPT 1/8"	-60 - +250
M015, MD015, MP015	1,9	88	NPT 1/4"	
M050, MD015, MP015	4,3	92	NPT 1/2"	

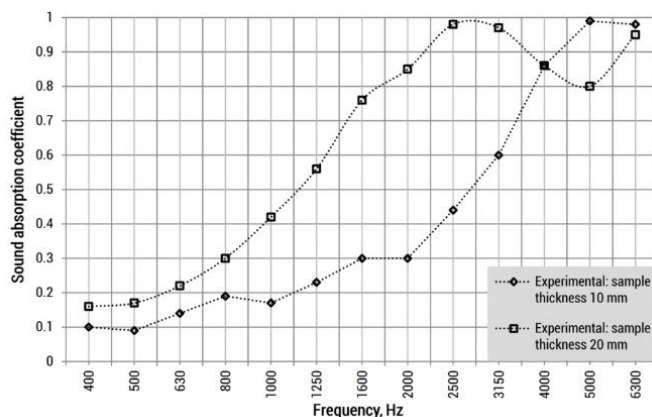
All the above mentioned parameters are measured at pressure drop between inlet and normal atmosphere 0,63 MPa

## SOUND INSULATION SHIELDS

OPENPORE cast aluminum is sound insulation material that is able to reduce the noise according to your specification. To absorb the specified noise frequency, the pore sizes can be adjusted.

The typical spectral diagram of the normal sound absorption coefficient is shown on the right. It is interesting that one can optimally adjust the frequency of the sound absorption coefficient by selecting the correct material parameters. This can also be simulated with CAE.

Model	L, mm	W, mm	H, mm
P-500-250-10	500	250	10
P-500-250-25	500	250	25
P-500-250-50	500	250	50
P-500-250-100	500	250	100
P-850-450-10	850	450	10
P-850-450-25	850	450	25
P-850-450-50	850	450	50
P-850-450-100	850	450	100

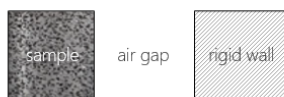
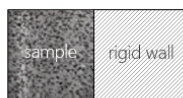


## VEHICLE EXHAUST SILENCER

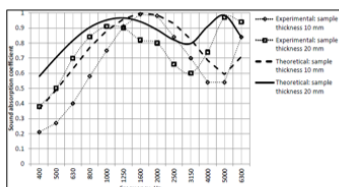
Automotive OEM sound absorption test. Standing wave method.

Brüel & Kjær impedance tube type 4206 and acoustic spectrum analyzer 2144. Infiltration pressure drop 0,5 bar.

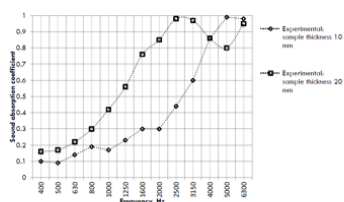
### Measurement setup



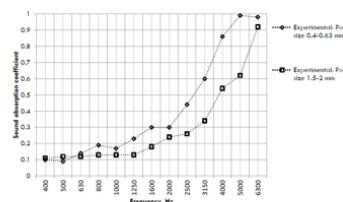
### Theory vs. Practice (Example with air gap)



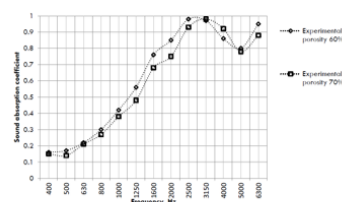
### Pore size 0,4-0,63 mm / Porosity 60%



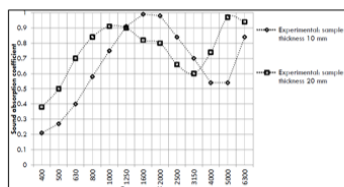
### Thickness 10 mm / Porosity 60%



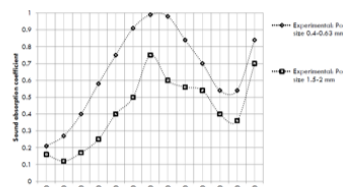
### Pore size 0,4-0,63 mm / Thickness 10 mm



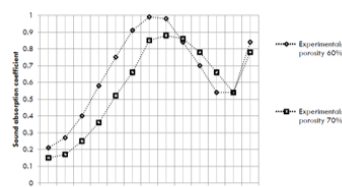
### Pore size 0,4-0,63 mm / Porosity 60% Air gap 20 mm



### Thickness 10 mm / Porosity 60% Air gap 20 mm



### Pore size 0,4-0,63 mm / Thickness 10 mm Air gap 20 mm





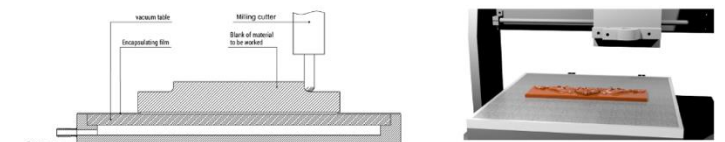
## TOOLS AND MACHINE PARTS

### THERMOFORMING AND PARTICULATE FOAMS

Innovative, open-pored, media permeable molds from OPENPORE chill casting aluminum differ from conventional tools made of solid aluminum or sintering / composite materials and offer functional, qualitative and economic advantages in processing of thermoforming, particle foams or molded fiber. Made from conventional Al casting alloys in chill casting, without the use of pollutants, binders, solvents or gases. Only aluminum, electricity, water and NaCl salt.

- high performance material,
- stable, resilient, heat-resistant,
- adjustable pore sizes from a few microns to a few centimeters,
- novel pore morphology with many advantages compared to other porous structures,
- very good mechanical, fluidic, thermal and acoustic properties,
- very good, spatially homogeneous air / water permeability,
- less energy consumption during steaming and venting,
- 50% lighter than solid aluminum,
- less material consumption,
- less energy consumption,
- 100% media permeable volume incl. corners, edges, radii,
- more complex part geometry,
- better part quality,
- no ventilation holes necessary - no drilling, less labor,
- shorter cycle time through very good thermal conductivity (up to 50 W/mK) and rapid heating and cooling,
- conventional CNC precision machining and surface finishing,
- new possibilities for functional integration, such as thread, pipes and much more,
- flexible integration of massive material areas into the foam structure,
- flexible integration of selectively porous areas into the massive material,
- flexible fastening solutions,
- intelligent tool concepts through a combination of porous components with different pore sizes with conventional components,
- and much more.

### COMPRESSED AIR AND VACUUM TECHNOLOGY



#### Air cushion.

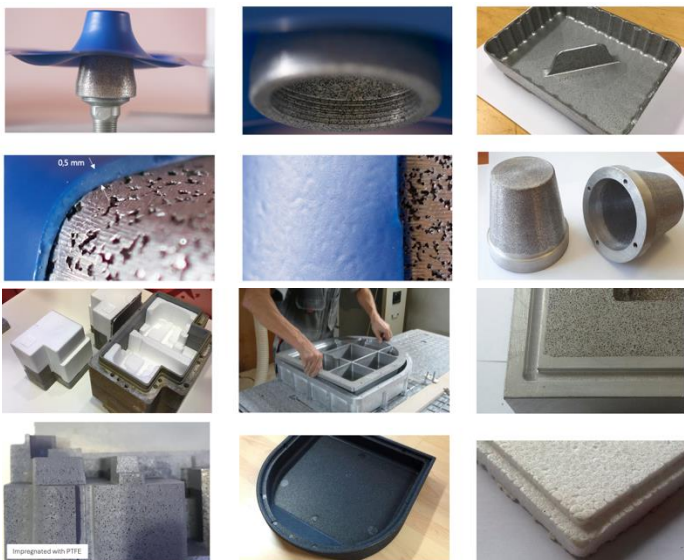
The porous aluminum roller enables contactless redirection of silicone foils and is a lighter, mechanically stable alternative to conventional shafts. It offers optimized compressed air distribution, high air permeability, excellent surface properties, and prevents damage to thin foils.

#### Labeling machines.

Quality issues with porous plastic suction plates in labeling were resolved through prototype testing with varying plate thicknesses and pore sizes, leading to the worldwide machine retrofit for the customer.

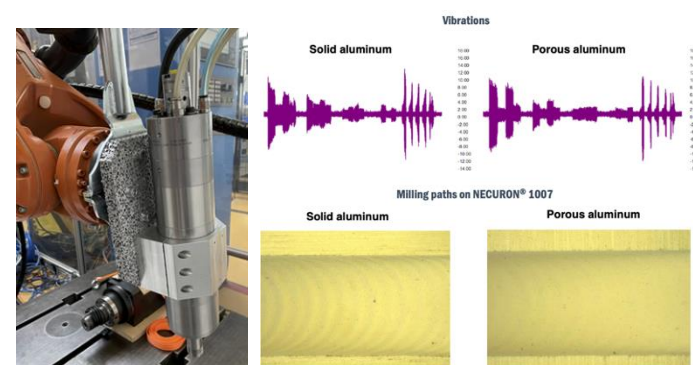
#### Vacuum tables.

Vacuum clamping tables for various materials were optimized through prototype testing to balance design, weight, functionality, and cost—now used worldwide.

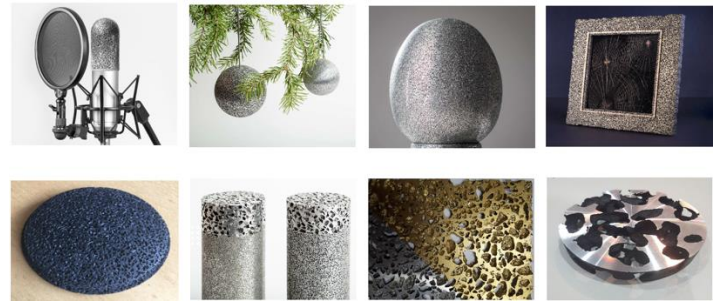


### MILLING SPINDLE

Porous aluminum reduces weight while maintaining damping properties, allowing optimized inertia without additional vibrations—ideal for automation and tooling technology. To further enhance vibration damping.



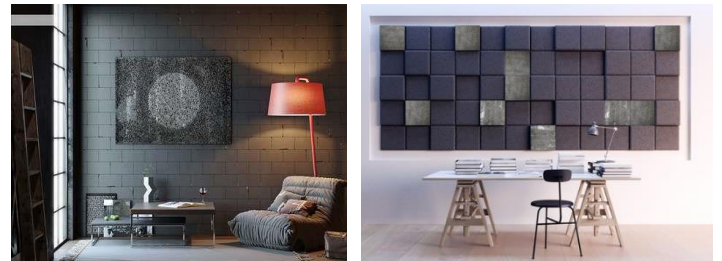
## ARCHITECTURE AND DESIGN



## INTERIOR



## DECORATION



## BATHROOM



## LIGHT

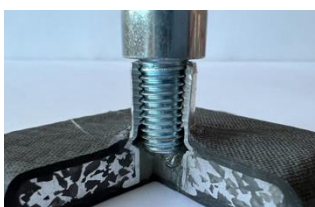




## INNOVATIONS

### NOVEL HYBRID COMPONENTS

Worldwide new hybrid aluminum-polymer components can be produced in different manufacturing processes such as injection molding, thermoforming, RTM, blow molding, additive manufacturing and others. The bond between polymer and aluminum is enormously strong, tight and requires no chemicals for pretreatment or adhesion.



### NOVEL COOLING SYSTEMS

PORECOOL cooling systems are up to 70% smaller and lighter than comparable conventional solutions. For more information please visit [www.porecool.com](http://www.porecool.com)

porous cooling systems

UNIQUE WORLDWIDE

BEFORE

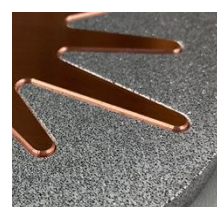
AFTER

up to **70%**  
smaller and lighter

NEW TECHNOLOGY FOR POWERFUL, LIGHTWEIGHT AND COMPACT COOLING SYSTEMS

Think differently. Cool better.

**COOLING SYSTEMS MADE OF POROUS ALUMINUM**



### EXAMPLE OF MATERIAL PROPERTIES

The following table presents selected material types, primarily optimized for acoustic applications such as compressed air silencer, while also performing well in filtration and vacuum technology. The standard alloy used is **AlSi7Mg0,3**, but it can be replaced with any standard aluminum alloy to meet specific requirements. There are no specific DIN / ISO standards for our material. The values serve as a guideline and must be validated for a specific application through limit samples and specific testing.



200-400



315-630



1600-3000

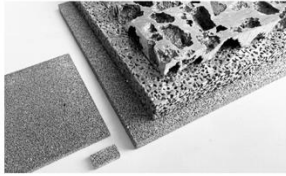


5000-20000

Material Code	100-200	140-315	200-400	315-630	630-1000	1000-1600	1600-3000
Material	AlSi7Mg0,3						
Porosity, %	55 ± 5%						
Filtration degree, µm	5	10-15	25-35	40-60	80-110	120-150	200-250
Ultimate compressive strength, MPa	118	105	59	58	49	37	32
Yield point at compression, MPa	44	39	26	24	20	21	20
Ultimate tensile strength, MPa	33	29	16	16.5	14	12	8
Yield point at tensile, MPa	30	26	14	16	13	13	7
Ultimate shear stress, MPa	41	36	34	30	25	26	-
Young's modulus, GPa	3.5	3.1	2	1.9	1.7	1.7	1.6
Elongation, %	0,25	0,29	0,38	0,27	0,32	0,3	0,12



## PRODUCTS AND PROCESSING



**PLATES**



**CYLINDERS**



**PIPES**



**MOULDINGS**



**DRAWING PARTS**

### Materials and material properties

Standard materials are AlSi7Mg0,3 and Al99,5%. Other aluminium alloys are available on request.

The material properties are selected from standard materials or newly adjusted for specific projects.

### Part dimensions

Standard dimensions available immediately: diameter max. 600 mm, length max. 800 mm, wall thickness min. 2 mm.

Special tools can be made for other dimensions.

The feasibility limit is determined by the interaction of the following parameters:

- pore size
- component size
- component geometry
- component volume

### Quantities and cost-effectiveness

Both single pieces (e.g. toolmaking) and large series (e.g. automotive industry) can be produced.

The economic viability of the solution is strongly dependent on the specific application.

### Processing and delivery condition

We supply sawn, milled, turned and ground semi-finished and finished parts as standard.

If required, all other conventional processing and surface treatments suitable for aluminium can be applied.

### Samples

Without expert knowledge and tailored application advice, misunderstandings, misinterpretations, and disappointments are unavoidable.

We do not provide free samples, standard samples or material remnants.

Sample provision is only available after technical consultation and agreement on a validation matrix. This matrix considers various combinations of pore sizes, wall thicknesses, process parameters, and other relevant characteristics.

### Minimum quantity and order value

The minimum quantity for series production is 100 pieces.

The minimum order value for samples is 1.200 EUR. Depending on complexity and size, this allows for the production of 3 to 30 samples.

## OUR OFFER

### 1. Telephone call (free of charge)

Your project, product, challenge and our possible support.

### 2. Quick Potential Assessment (free of charge)

NDA. Your product, challenges and goals. Our solution approaches and potential forecast. Next steps for feasibility study.

### 3. Feasibility study

Physical and / or digital prototypes. Validation. Optimization.

### 4. Product development

Final design. Procurement.

### 5. Manufacturing

EMPB. Ramp-up. Delivery.

For more informations and videos please visit our websites:

[www.porecool.com](http://www.porecool.com) [www.openpore.com](http://www.openpore.com) [www.automoteam.com](http://www.automoteam.com)

## AGILE PRODUCT DEVELOPMENT PROCESS

### DEVELOPMENT SERVICES

Porous aluminum is an innovative material with a unique combination of properties that can be tailored to a wide range of applications.

Its potential extends beyond individual characteristics, offering solutions that integrate mechanical, thermal, acoustic, decorative, constructive, and technological benefits. Unlocking its full potential requires specialized expertise and a flexible approach to development.

Every industry has unique challenges, and the requirements for optimized components vary accordingly. Whether in industrial engineering, architecture, lightweight construction, automation, or other fields, the development of components demands a comprehensive evaluation of multiple material properties. Depending on the specific application, emphasis can be placed on different aspects such as mechanical strength, flow behavior, heat dissipation, sound absorption, surface aesthetics, or production feasibility.

With our development services, we support you from the initial feasibility analysis through simulation and prototyping to production readiness. Our structured process ensures a solution-oriented approach that adapts to the diverse needs of various industries and applications.

#### 1. Consultation call

The first step is a non-binding, free consultation, where we discuss your requirements and goals. This allows for an initial assessment of how OPENPORE aluminum can contribute to your project by enhancing functionality, improving efficiency, or providing new design possibilities.

#### 2. Quick Potential Assessment

At this stage, we analyze the framework conditions of your application to determine the suitability of OPENPORE aluminum components. Key aspects include:

- Structural and mechanical requirements.
- Thermal and flow-related considerations.
- Acoustic and decorative aspects.
- Functional integration potential.
- Feasibility for different manufacturing processes.

Since every project is unique, we evaluate possible development directions based on specific objectives. Whether the focus is on performance enhancement, weight reduction, system integration, or design flexibility, we align our approach with your priorities.

The results are discussed in an online meeting, where we jointly define the scope of the feasibility study to efficiently assess technical and economic viability.

#### 3. Feasibility Study

To validate the optimal component design, we offer multiple approaches:

- Digital prototypes: Simulations to explore and optimize design options.
- Physical prototypes: Real-world testing for validation and fine-tuning.
- Hybrid approach: Combining simulations and prototypes for accelerated results.

Each project requires a tailored selection of material parameters. Since porous aluminum is not covered by standard simulation tools, we develop custom digital models that are verified through laboratory tests. By correlating simulation data with physical testing, we ensure accurate predictions and reliable results.

- Reference measurements in specialized research laboratories: Comparative testing in collaboration with our research partners to establish reliable performance benchmarks.
- Customer testing under real conditions: Providing samples for independent evaluation in the target application.

After analyzing the test results, we discuss findings and define the next steps to refine the solution.

#### 4. Product Development

Once the feasibility study confirms a viable solution, we optimize the design for series production. The Design for Manufacturing (DFM) phase ensures that the final component meets both functional and economic requirements while maintaining efficiency in large-scale production.

The outcome is a fully production-ready component, with all necessary documentation and validation procedures aligned with customer specifications.

#### 5. Production Ramp-up & Series Manufacturing

The final phase involves transitioning from development to manufacturing, including:

- Pilot production: Small-scale batches for validation before mass production.
- Production validation: Ensuring consistent quality and performance.
- Full-scale manufacturing with specialized production partners.

By following a structured approach, we ensure a smooth and efficient transition from concept to final production.

### AGILE DEVELOPMENT APPROACH

The development process follows an agile methodology with the goal of generating usable results in rapid iterations while keeping budgets manageable. By working in small, incremental steps, we ensure flexibility and adaptability throughout the process. This allows us to quickly respond to new insights, refine concepts efficiently, and tailor solutions to specific requirements. The agile approach not only accelerates development but also optimizes resource allocation, ensuring cost-effective and result-oriented innovation.

### WHY CHOOSE OPENPORE COMPONENTS?

- Versatile material properties adaptable to diverse applications.
- Lightweight, high-strength designs with optimized performance.
- Seamless integration of multiple functional aspects.
- Efficient, scalable, and cost-effective manufacturing solutions.
- Sustainable and recyclable material for long-term solutions.

### START YOUR OPENPORE JOURNEY TODAY!

Let's develop innovative solutions together—contact us to explore the possibilities of OPENPORE aluminum!

## TECHNOLOGY IMPRESSIONS



Air cooling



Plastic cooling



Multimaterial hybrids



Lightweight tools



Technical components



Molding tools



Water cooling



Shock absorber



Sensor protection



Gas distribution



Filtration



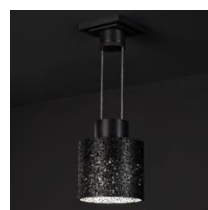
Muffler



Architecture



Light panels



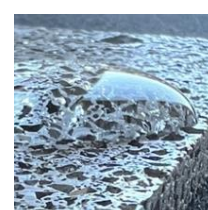
Lamps



Design



Capillaries



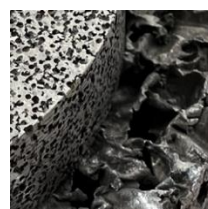
Splash protection



Alternative for sintered bronze



Alternative for sintered steel



Alternative for aluminum foam



Vacuum tables



Vacuum transport



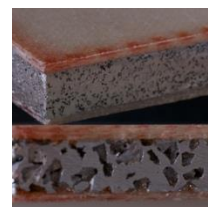
Functional surfaces



Monomaterial hybrids I



Monomaterial hybrids II



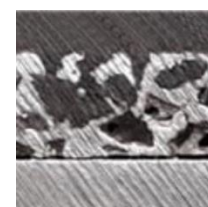
Glas fiber hybrids



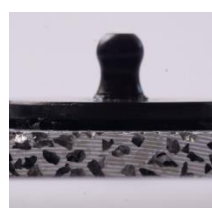
Carbon fiber hybrids



Injection molding hybrids



Thermoforming hybrids



Ultrasonic welding



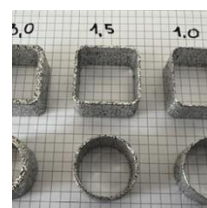
Gluing and pressing



Thread



Fastenings



Machining



3D printing hybrids