

## Technical data

**Table 4**

Tube sizing range	D out (mm)	D in (mm)	Length (mm)
	0.72 - 18.50	0.35 - 16.78	0 - 1000

Materials: Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub> (and more on request)

Dmax: 21.0 mm

Base powder: Aluminum oxide	Pore size* (µm)	Flux (kg/m <sup>2</sup> /bar/uur)	P <sub>burst</sub> ** (bar)	Surface roughness (µm)
Philips 1.1	0.2	150		0.1
Philips 2.1	0.6	1000		0.2
Philips 3.1	0.6	380	10	1.0
Philips 3.2	0.8	480	50	1.2
Philips 3.3	0.9	650		1.6
Philips 4.1	1.8	4600	7	1.1
Philips 4.2	1.8	3700	40	1.0

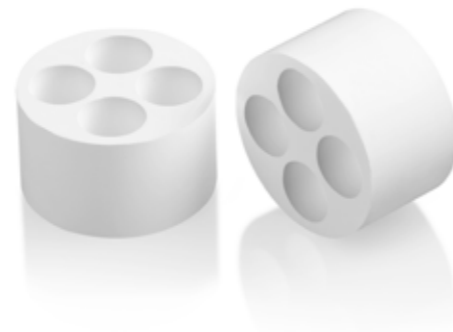
(Wall thickness 0.8 mm / outer diameter 8.6 mm / oven temperature >1000°C)

\* measured with "bubble point" method

\*\* typical value

## We offer:

- Ceramic membranes and carriers with extreme homogeneity and narrow pore size distributions in the range of 0.1 till 2.0 µm.
- Dense ceramic membranes for gas separation and gas lines.
- Coated ceramic ultra-/nano filtration membranes for ranges under 0,1 µm (together with our partners).
- Multiple lines of mass scale extrusion with inline rapid drying technology providing optimal tolerances and smooth surface finish.
- Ceramic injection molding lines offering virtually complete freedom of shapes and detailing.
- Ceramic-ceramic and metal-ceramic sealing technology providing elimination of polymeric seals.
- Lean robotized manufacturing with 100% in-line vision inspection.
- Translucent production possible (ultra clean processes and controlled hydrogen sintering in industrial furnaces).



# Ceramic membranes for optimal separation

## Contact:

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All mentioned data are indications only and may vary dependent on circumstances. The data should not be used as absolute engineering data or constituting a warranty or representation for which we assume legal responsibility

Philips Ceramics Uden | Ceramic Solution Provider

**PHILIPS**

## Ceramic membranes

Philips Ceramics Uden has developed ceramic membranes and carriers for optimal separation of a wide range of fluids and gases. The use of ceramics (compared to polymers) offers a narrow pore size distribution exactly matching the components to be separated, resistance against aggressive chemicals, high temperatures, a high and constant flux and a long service life. Ceramic carriers are an ideal base for membranes and micro-filtration applications in the chemical, pharmaceutical and food industry as well as in water and wastewater processing.

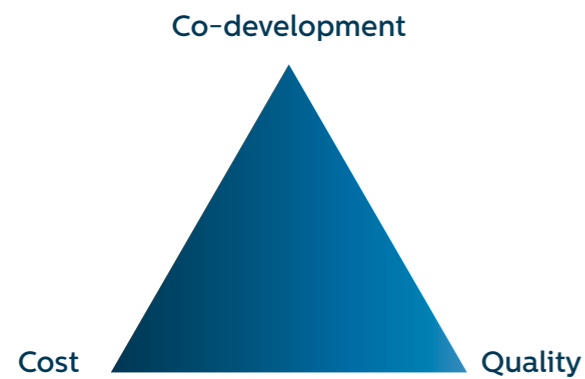
## Applications

Initially, ceramic membranes were used in wastewater technology. Meanwhile, successful solutions and possible applications cover all industries where liquid and gaseous components are separated.

- Chemical
- Oil and Gas
- Steel
- Power and Electronics
- Paper and Pulp
- Pharmaceutical
- Biotechnology
- Drinking water
- Waste water
- Food and Beverages
  - Dairy
  - Beer
  - Wine
  - Fruit juice

## Why to choose us?

We have been applying our knowledge of developing high quality high purity ultra-homogenous ceramic materials for a long time in the lighting industry. Now this extensive experience is applied for the development of porous tubes for filtration and membrane carriers. With our experience, in-house R&D team, and highly automated manufacturing facility we provide the most reliable products at the best economy of scale.



## Our newest designs

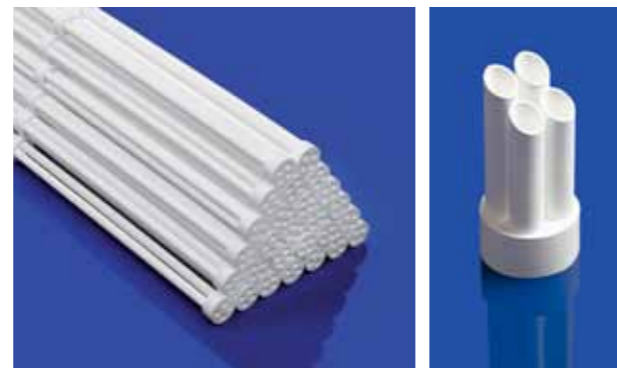
Recently we have developed a modular system that replaces and improves the multi-channel systems available in the market today. The modular system has an increased flux efficiency which ensures a high flux over a wide range of pore sizes. The superior surface quality of the ceramic carrier enables an optimization of the coating process, by reducing the number of coating steps. A wide variety of coated membrane types are applied by our clients and partners, comprising:

- Pervaporation (PV)
- Gas separation with ion transfer (ITM)
- Zeolite coated molecular sieve membranes (ZM)
- Membrane connectors and gas lines

The carrier can also be used without any coating i.e. in micro-filtration (MF) application.



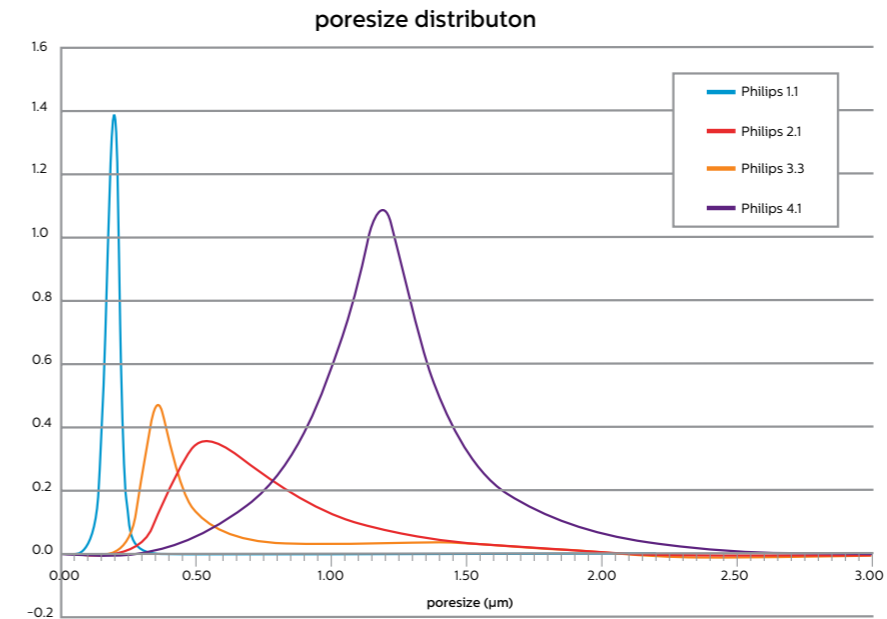
A tubular membrane assembly with a typical all-ceramic membrane seal



Next to our modular system we can provide polymer-free all ceramic sealing for membrane tube assemblies. This leads to maintenance free long life seals which are able to resist much higher temperatures and pressures compared with polymeric seals and is fully inert. This opens up completely new applications for ceramic membranes. Additionally, the absence of polymeric seals is a clear advantage for sanitary membranes greatly reducing sensitivity for bacterial infection at the seals by a full fit. These seals are therefore also compatible with severe back washes with aggressive chemicals in order to clean filters, leading to low maintenance costs.

## Technology & Analysis

Extrusion of high-quality alumina tubes is one of our core technologies. The special drying process enables us to produce tubes and rods with high dimensional accuracy, complete homogeneity and smooth surface finish.



Alumina, pore size > 1µm  
SEM picture magnified x40



Alumina, pore size 0.1µm  
SEM picture magnified x40

In ceramic membrane quality the material must be fully homogeneous, with neither voids, nor coarse particles or micro-cracks. We use the highest quality and purity of raw materials, in-house compounding and an optimized extrusion processes in order to provide the best quality of ceramic carriers and membranes for your application. We can apply a 100% automated check to actually safeguard this high quality, which is unique in the membrane production sector.

Mass production of tubes at  
Philips Ceramics Uden

