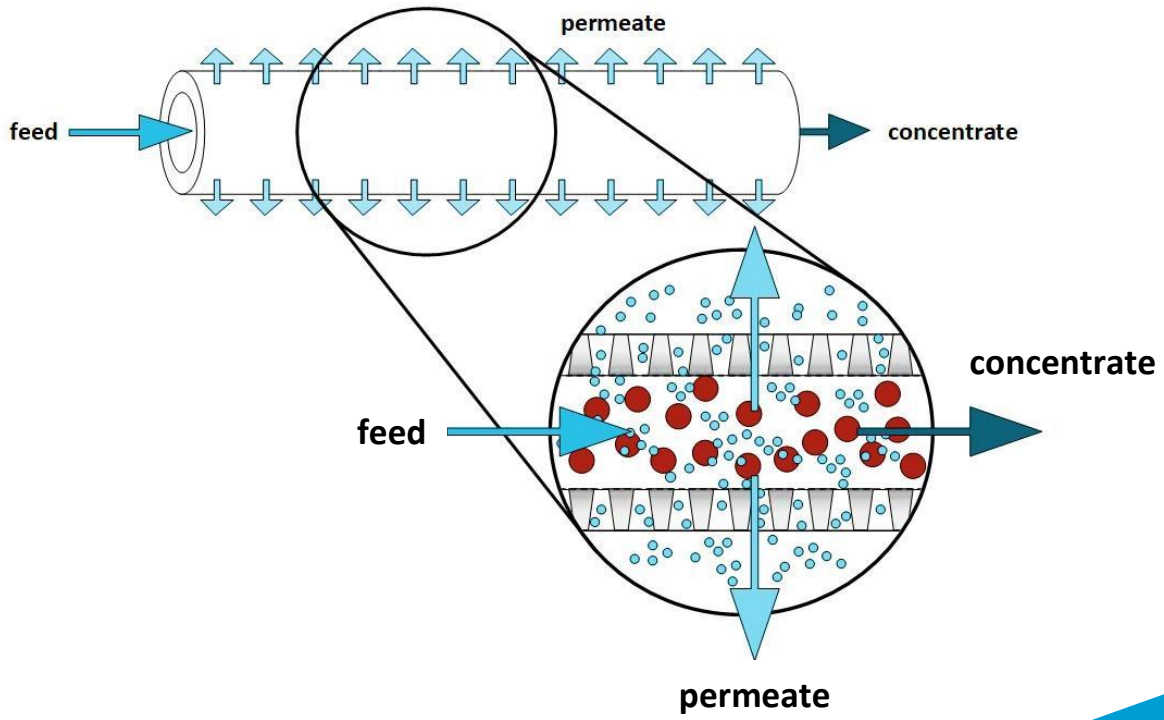
Membranes and geometries

Ceramic membranes – multifunctional in application:

Our ceramic **cross-flow elements** are tubular **geometries** and have a certain number of channels with different channel diameters depending on the application. One or more filter elements can be combined in a stainless-steel housing and form a **module**. These modules are installed in filtration systems.

The process medium (**feed**) flows at a certain velocity through the channels over the membrane layer (active layer) coated on the inside. The operating pressure is the driving force for the filtration process, separating the process medium into **permeate** and **concentrate**. Particles larger than the pores of the membrane are retained (concentrate), while smaller particles pass through the pores of the membrane and the support and are collected in the module as the permeate.

Ceramic membranes are used in a growing range of applications due to their high reliability and high chemical resistance against concentrated caustics and acids.



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Membranes and geometries

Membrane materials and pore sizes:

Inopor® offers high quality ceramic elements with membrane layers in a wide range of pore sizes including microfiltration, ultrafiltration and cutting edge nanofiltration. These membrane layers are produced with state-of-the-art membrane manufacturing technology.

The product offering includes specialized membrane elements*[1]; e.g. with a modified membrane layer (hydrophobic properties) or for abrasive environments.

	Membrane material	Pore size	Porosity
inopor® micro	α-Al_2O_3	1100 nm	40 - 55 %
		800 nm	
		600 nm	
		400 nm	
		200 nm	
		100 nm	
		70 nm	

	Membrane material	Pore size	Cut-Off*[2]	Porosity
inopor® ultra	TiO_2	30 nm	100 kDa	30 - 55 %
		10 nm	20 kDa	
		5 nm	8.5 kDa	
	ZrO_2	3 nm	2 kDa	
inopor® nano	TiO_2	1.0 nm	750 Da	30 - 40 %
		0.9 nm	450 Da	
		LC[3]*	200 Da	

Membrane geometries:

Cross-flow elements consist of a **support structure** and the **membrane**. The support is made of α-Al_2O_3, while the individual membranes can be made of different ceramic materials.
Industrial-scale geometries are available in standard lengths of 1178 and 1200 mm. Lengths between 100 and 1200 mm are available upon request.

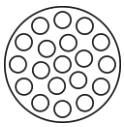
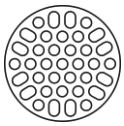
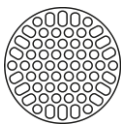
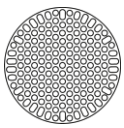
Our geometries are sealed on both ends, using one of the following materials: Ceramic, Glass and Teflon.

Custom geometries can be developed and quoted upon request.

Testing geometry length 500 mm		Outer diameter*[4]	Inner diameter	Channels	Specific membrane area	Membrane area (1200 mm length)	Face area of channels
Ceramic element		*[mm]*	*[mm]*	*no.*	$[\frac{m^2}{m}]$	$[m^2]$	$[mm^2]$
	AA	10	7	1	0.022	0.026	38.5

Membranes and geometries

Industrial-scale geometries Outer diameter 25 mm		Outer diameter*4	Inner diameter	Channels	Specific membrane area	Membrane area (1200 mm length)	Face area of channels
Ceramic element		[mm]	[mm]	no.	$[\frac{m^2}{m}]$	$[m^2]$	$[mm^2]$
	BA	25	6	7	0.132	0.158	197.9
	CA	25	3.5	19	0.209	0.251	182.8
	GA	25	3	31	0.315	0.378	237.4
	EC	25	2	61	0.383	0.460	191.6

Industrial-scale geometries Outer diameter 41 mm		Outer diameter*4	Inner diameter	Channels	Specific membrane area	Membrane area (1200 mm length)	Face area of channels
Ceramic element		[mm]	[mm]	no.	$[\frac{m^2}{m}]$	$[m^2]$	$[mm^2]$
	CC	41	6	19	0.358	0.430	537.2
	MC	41	3.8	37	0.490	0.588	511.5
	EE	41	3.4	61	0.723	0.868	674.0
	HA	41	2	163	1.094	1.313	580.4

Please contact us for further support.

*1 Specialized membranes may not be available in all configuration. Please contact us for availability.

*2 The cut-off was determined indirectly by measurement of polyethylene glycol (PEG) retention in aqueous solution. The value should be used as a guideline and a testing starting point since retention varies with application and conditions. Membrane selection is the responsibility of the purchaser. We are happy to offer application laboratory testing to support the selection.

*3 The LC membranes are our finest membrane and development. Currently, these membranes are manufactured for pilot testing, but are commercially available.

*4 The outer diameter may increase due to the end sealing. Glass end sealing results in the largest increase.