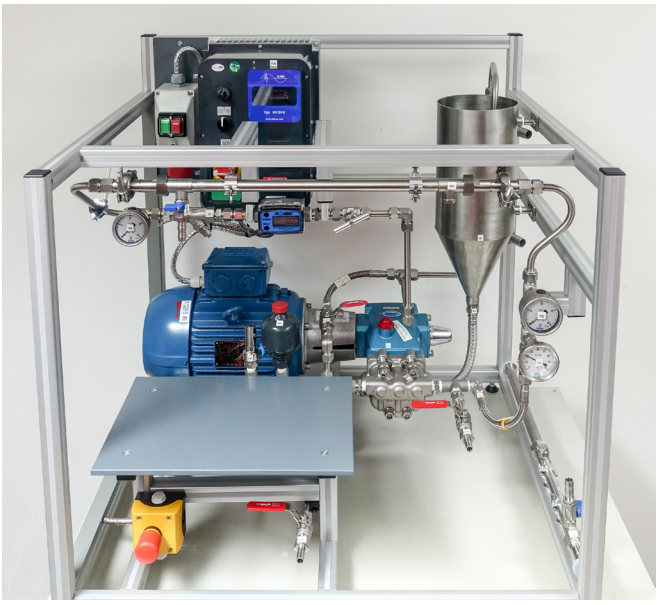
Housings and plants for ceramic membranes in aqueous environments

Fraunhofer IKTS

Development and prototype production of ceramic membranes form a research focus at Fraunhofer IKTS. The institute is focused on the development of membranes for different membrane-based processes (MF, UF, NF, OSN, VP, PV, GS, MD, membrane contactor and adsorption).



Filtration plant (lab scale), table-top construction, built by Fraunhofer IKTS.

Fraunhofer IKTS maintains an Application Center Membrane Technology for the practical implementation in the field of liquid phase investigations. Here, prototype membranes are given their first housings and plants are designed, built and tested. Typically, housings and plants are manufactured in stainless steel, but it is also possible to use materials such as PP, PVC and PTFE.

All IKTS-made housings represent a pressure vessel in the sense of the Pressure Equipment Directive (sound engineering practice, CE mark is not awarded) and can be used for the filtration of liquid media in fluid group 2, if the vapor pressure of the fluid does not exceed normal atmospheric pressure (1013 mbar) at the maximum permissible design temperature by more than 0.5 bar. All filtration plants are CE marked and certified accordingly.

Service portfolio

- Development, construction and production of membrane (test) equipment, membrane housings and test plants (lab to pilot scale)
- Development of customer-specific membrane processes (laboratory tests, concept development and piloting)
- (Basic) process engineering and plant design (as support for customer implementation)
- Customer support (by phone and on-site)

Membrane housing for the usage of an element with a diameter of 36 mm, typical connection options are shown, built by Fraunhofer IKTS.

For more information please turn the page.

Exemplary housing types[1] for filtration

Description	**M1-10xXXX-PN40-???** (usually for single channel element)	**M1-25xXXX-PN25-???** (usually for multi-channel element)
Material	V4A (1.4571)	
Design conditions[2]	40 bar up to 100 °C (PN40)	25 bar up to 100 °C (PN25)
Capacity	1 x tubular element (diameter: 10 mm, length: up to 500 mm)	1 x tubular element (diameter: 25 mm, length: up to 1200 mm)
Connections[3]	1x feed/ 1x retentate / 2x permeate: G1/4 "(internal thread)	1x feed/ 1x retentate: G3/4" (internal thread), 2x permeate: G1/2" (internal thread)
Seals	O-ring EPDM (NBR, FKM, FFKM, … as requested)	
Welding process	Tungsten Inert-Gas (pickled, passivated and rinsed, strength tested)	
Accessories	as requested	

Possible types of filtration plants[4]

Description	**Laboratory scale** (usually for single channel element, membrane area up to 0.011 m2)	**Pilot scale** (usually for multi-channel element, membrane area up to 2.5 m²)
System type	cross-flow, 1-pump system with heat exchanger	
Design parameters	up to 30 bar at 80 °C	up to 16 bar at 80 °C
Capacity	1 x element (diameter: 10 mm, length: up to 500 mm)	2 x elements (diameter: 25/41 mm, length: up to 1200 mm)
Feed vessel	4.5 L, open (alternatives on request)	55 L, open (alternatives on request)
Automation	manual, pump with frequency control	PLC control with "touch"; pressure control (manual flow adjustment is required), automatic filling, level control, protection against dry running, heating/cooling function
Dimensions	850 x 860 x 710 mm (W x H x D), table-top	1500 x 1800 x 800 mm (W x H x D), rollable
Weight	95 kg	320 kg
Power supply	1 x 230 V or 3 x 380/400 V, 50/60 Hz, 16 A	3 x 380/400 V, 50/60 Hz, 16 A
Accessories	isolation, thermostat, additional modules, as requested	backwash/ pulse unit, isolation, thermostat, external filling and product discharge pump, additional modules, as requested

[1] XXX – length of the membrane element; ??? – type of connection, modules for element diameter from 10 mm to 41 mm are available.

[2] At elevated temperatures, the operating pressures should be reduced compared to the nominal pressure (PN) as follows: 100 °C – 8 %, 150 °C – 13 %, 200 °C – 18 %, 250 °C – 23 % , 300 °C - 28 %, 350 °C – 30 %, 400 °C – 33 % (applies to 1.5471 according to DIN EN 10088-3:2014). At elevated temperatures, a new classification with regard to the Pressure Equipment Directive must be made.

[3] Standard is given, alternatives as requested (e.g. pipe end for cutting ring screw connection, tri-clamp, internal or external thread, welding socket).

[4] Changes according to customer requests possible at any time. All information is approximate and may vary in individual cases.

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