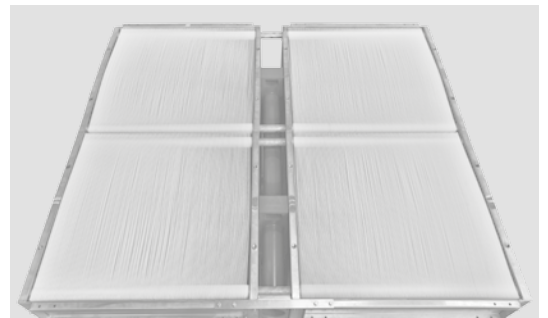
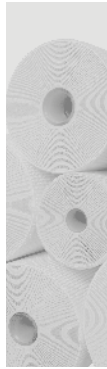


LENNTECH

info@lenntech.com Tel. +31-152-610-900

www.lenntech.com Fax. +31-152-616-289



THE ART TO CLEAR SOLUTIONS

PRODUCTS



**MICRODYN
NADIR**

ADVANCED SEPARATION TECHNOLOGIES

SEPARATION – OUR PASSION

Membrane technology is one of the **most promising and innovative technologies**. It is easy to use and highly versatile and the most product friendly, environment friendly and energy efficient way to clean, concentrate or fractionate liquids.



Walter Lamparter
Managing Director

For the plant manufacturer, it's vitally important to choose the right product for each separation process. MICRODYN-NADIR GmbH has the technical knowledge and experience to help you make the right choice.

For more than 50 years, we have been passionate about developing and producing membranes and modules for microfiltration, ultrafiltration and nanofiltration. Every year, we invest more than 10% of our turnover in the continuous improvement of our products. Our entire production site has recently been enlarged with several new production lines. The production processes have been optimized and redefined, resulting in increased product quality, productivity and efficiency.

Thanks to this investment program, we can now offer an even larger range of innovative membranes and modules, which open up many new application opportunities for membrane technology. In this catalogue we present our current product range and introduce the corresponding possibilities for their application.

Our mission is to support you day-in, day-out with our high-quality membrane products, delivering more efficient membrane processes and greater success for you in your markets.

MICRODYN-NADIR GmbH is a membrane and module specialist with a global outlook. We are not satisfied until our products have been successfully integrated into your customers' plants and processes. This is our passion.

Challenge us!

Walter Lamparter // CEO

THE SOLUTIONS PROVIDER

With a product range that combines the most advanced membranes with innovative module technologies, **MICRODYN-NADIR offers its customers complete solutions.** Whether your application is in microfiltration, ultrafiltration or nanofiltration, we can supply hollow fiber, tubular or spiral wound modules that will deliver perfect results, even in submerged applications.

MARKET SECTOR

ENVIRONMENT

WATER

FOOD AND BEVERAGE*

APPLICATION

- » Municipal wastewater
- » Effluent treatment after biological treatment plants
- » elimination of micro-pollutants
- » Filtration of lipophilic substances
- » Treatment of cosmetics wastewater
- » Wastewater from food and beverages
- » Treatment of animal feces
- » Car wash water recycling
- » Filtration of colloidal substances
- » Oil/water separation
- » Separation of emulsions and suspensions
- » Removal of biomass
- » Retention of cooling lubricants

- » Effluent treatment
after biological wastewater plants
- » Pre-treatment for reverse osmosis
(sea water and brackish water desalination)
- » Stormwater treatment
- » Surface water treatment
- » Borehole water treatment
- » Karst water filtration
- » Drinking water filtration

- » Standardization of milk
- » Cream cheese production
- » Concentration of liquid egg and gelatine
- » Whey concentration
- » Clarification of cheese brine
- » Clarification of fish brine
- » Filtration of marinades
- » Vinegar filtration
- » Clarification of juices
- » Clarification of wine
- » Defattening of whey

SOLUTION

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

BIO-CEL®
Submerged modules

SEPRODYN®
Modules for fine filtration

MICRODYN
Tubular and capillary modules

AQUADYN®
Hollow fiber modules for water filtration

ULTRADYN
Hollow fiber modules for ultrafiltration

AQUADYN®
Hollow fiber modules for water filtration

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

MARKET SECTOR

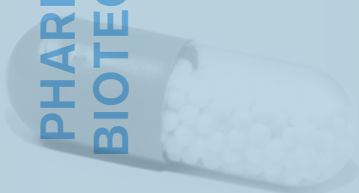
CHEMICAL PROCESSES



APPLICATION

- » Preparation of process water
- » Catalyst separation
- » Dye desalination
- » Latex concentration
- » Desalination of optical brighteners
- » Separation of dissolved materials or compounds after catalysis
- » Acid/caustic recycling
- » Filtration of suspended matter from heterogeneous reactions
- » Concentration after diafiltration

PHARMA BIOTECH*



- » Treatment of influent to fermentation process
- » Separation of cells or cell culture media from fermentation broth
- » Microfiltration in upstream processes as pre-treatment to further purification
- » Concentration of target products with ultrafiltration or nanofiltration
- » Membrane filtration as pre-treatment
- » Diafiltration of feed water
- » Production of ultrapure water

TEXTILE



- » Removal of dissolved dyes
- » Recovery of sizing agent
- » Washing solvent conditioning
- » Extending the lifetime of wash solutions
- » Wastewater treatment with membrane bioreactors (MBR)

SOLUTION

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

SEPRODYN®
Modules for fine filtration

MICRODYN
Tubular and capillary modules

ULTRADYN
Hollow fiber modules for ultrafiltration

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

MICRODYN
Capillary cartridges

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

BIO-CEL®
Submerged modules

SEPRODYN®
Modules for fine filtration

MICRODYN
Tubular and capillary modules

ULTRADYN
Hollow fiber modules for ultrafiltration

Note: (*) Suitability in your specific application needs to be confirmed by an official MICRODYN-NADIR representative.

MARKET SECTOR

ELECTRONICS

APPLICATION

- » Production of ultrapure water
- » Photoresists
- » CMP (chemical and mechanical planarization)

SOLUTION

SPIRA-CEL®
Spiral wound modules

SEPRODYN®
Modules for fine filtration

MICRODYN
Tubular and capillary modules

AQUADYN®
Hollow fiber modules for water filtration

ULTRADYN
Hollow fiber modules for ultrafiltration

E-COAT AUTOMOTIVE

- » Filtration of cathodic electrophoretic paint (CEP)
- » Filtration of anodic electrophoretic paint (AEP)
- » Paint recycling
- » Water based spray paint recovery
- » Degreasing baths servicing and maintenance

SPIRA-CEL®
Spiral wound modules

METAL

- » Treatment of rinse baths
- » Acid recovery
- » Lifetime extension of degreasing baths
- » Separation of oil/water emulsions
- » Treatment of phosphating baths
- » Separation of solids from process liquids
- » Treatment of coating baths
- » Recycling of water used in grinding
- » Heavy metal separation from galvanic wastewater

NADIR®
Membranes and formats

SPIRA-CEL®
Spiral wound modules

SEPRODYN®
Modules for fine filtration

MICRODYN
Tubular and capillary modules

NADIR®

BIO-CEL®

BIO-CEL®-MCP

AQUADYN®

SPIRA-CEL®

SEPRODYN®

MICRODYN

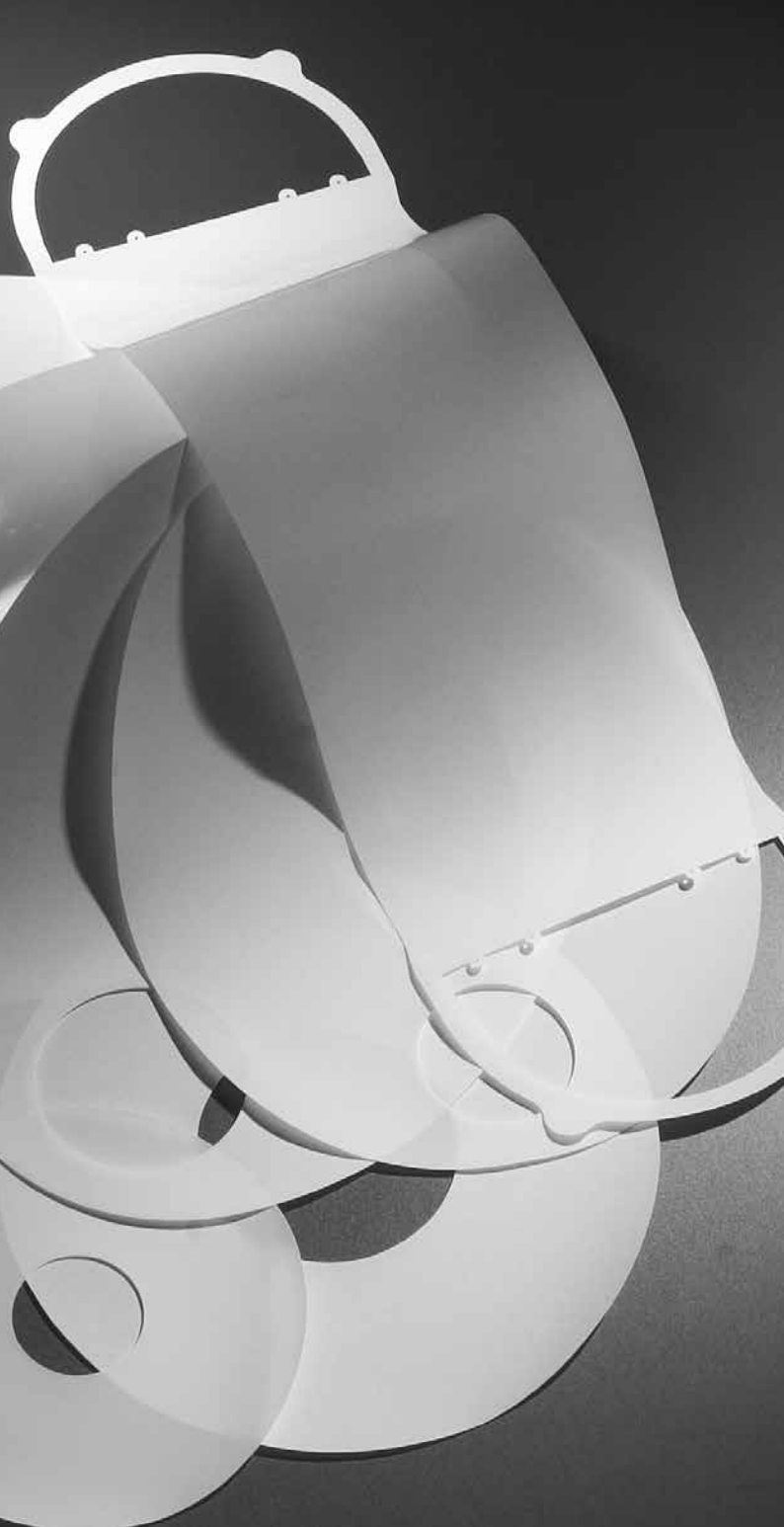
ULTRADYN

MAXIDYN

LENNTECH

info@lennotech.com Tel. +31-152-610-900

www.lennotech.com Fax. +31-152-616-289



NADIR®

Membranes and Formats

For more than 50 years MICRODYN-NADIR has been manufacturing membranes in Europe's largest membrane production facilities for industrial applications.

NADIR® membranes are permanently hydrophilic and chemically resistant. Micro-, ultra- and nanofiltration membranes are produced with high quality and consistency in a specially developed process.

The results speak for themselves: The unequalled hydrophilic properties of NADIR® membranes increase performance, longevity and significantly reduce fouling.

NADIR® membranes are available with cut-offs covering the spectrum of micro-, ultra- and nanofiltration applications.

NADIR® membranes are available in a range of polymeric materials:

- » **Polyethersulfone (PES)**
- » **Hydrophilic Polyethersulfone (PESH) and Polysulfone (PSUH)**
- » **Regenerated Cellulose (RC)**
- » **Polyvinylidene fluoride (PVDF)**

These materials can be used in a wide range of applications.

ADVANTAGES

- » high flux capacity
- » precise cut-offs
- » good fouling resistance
- » high thermal and chemical resistance

LENNTECH

info@lennotech.com Tel. +31-152-610-900
www.lennotech.com Fax. +31-152-616-289

Decoding of the product code: **U:P150**

Range	Type	Cut-off		
M Microfiltration	P PES	ultrafiltration (Nom. MWCO)	nanofiltration (Nom. Retention NaCl)	microfiltration (Nom. pore size)
U Ultrafiltration	H PESH			
N Nanofiltration	S PSUH			
	C RC			
	V PVDF			
		004 4 kDa	010 10 %	005 0.05 µm
		005 5 kDa	030 30 %	020 0.20 µm
		010 10 kDa		
		020 20 kDa		
		030 30 kDa		
		050 50 kDa		
		100 100 kDa		
		150 150 kDa		
		200 200 kDa		
		500 500 kDa		

Specifications

NADIR® Ultrafiltration Membranes	Nom. MWCO [kDa]	Membrane Material	Permeability [$\ell / (\text{m}^2 \text{hbar})$]
UH004	4	PESH	> 7
UP005	5	PES	> 10
UP010	10	PES	> 50
UP020	20	PES	> 70
UH030	30	PESH	> 35
UH050	50	PESH	> 85
UP150	150	PES	> 286
US100	100	PSUH	> 100
UC500	500	RC	> 250
UV150	150	PVDF	> 300

NADIR® Microfiltration-Membranes	Nom. Pore Size [μm]	Membrane Material	Permeability [$\ell / (\text{m}^2 \text{hbar})$]
MP005	0.05	PES	> 300
MV020	0.20	PVDF	> 700

NADIR® Nanofiltration-Membranes	Nom. Retention Na_2SO_4 [%]	Membrane Material	Water Flux @ 40 bar [$\ell / (\text{m}^2 \text{h})$]
NP010	35 - 75	PES	> 200
NP030	80 - 95	PES	> 40

Properties and area of application of NADIR® membranes

Membrane Material	Properties	pH-Range	Max. Temperature	Branch/Segment
Polyethersulfone (PES/ PESH) Polysulfone (PSUH)	Hydrophilic, high chemical resistance	0 - 14 1 - 14	95 °C	Environment, metal, textile, paper, food, pharma/biotech, chemical
Regenerated Cellulose (RC)	Extremely hydrophilic	1 - 11	55 °C	Environment, metal, paint, paper, pharma/biotech
Polyvinylidene fluoride (PVDF)	High stability against oxidizing agents	2 - 11	95 °C	Environment, paint, paper, metal, chemical, pharma/biotech

Final sizing and selection has to be approved by an official MICRODYN-NADIR representative. Please contact **phone + 49 611 962 6001** or **www.microdyn-nadir.de**



BIO-CEL®

Submerged Modules for MBR processes

Backwashable - Self-Healing - Mechanically Cleanable

Tighter discharge regulations, urbanization and the increase in water recycling have made Membrane Biological Reactors (MBR) the leading innovation in wastewater treatment through conventional activated sludge. Traditionally, activated sludge treatment relies upon solids settling in a secondary clarifier to separate the biomass from the treated wastewater. This process has the disadvantages of running at a lower MLSS (Mixed Liquor Suspended Solids), thus requiring more space and producing lower and varying quality effluent. With MBR technology, the clarifier is replaced by a physical barrier – our BIO-CEL® membrane module. This physical barrier enables the MBR to operate at higher MLSS levels, thereby requiring a smaller overall footprint. The BIO-CEL® membrane separates within the ultrafiltration spectrum, producing high capacities of quality effluent at consistent flows. Efficiency, reliability and cost effectiveness, as well as long term viability, are just some of the characteristics of the BIO-CEL® module. The solids free effluent is suitable for recycling applications, such as irrigation or feeds for process water. BIO-CEL® combines the benefits of traditional hollow fiber and plate and frame configurations without any of their inherent disadvantages. The self-supporting membrane sheet is just 2 mm thick, resulting in an extremely high packing density and very low specific energy consumption.

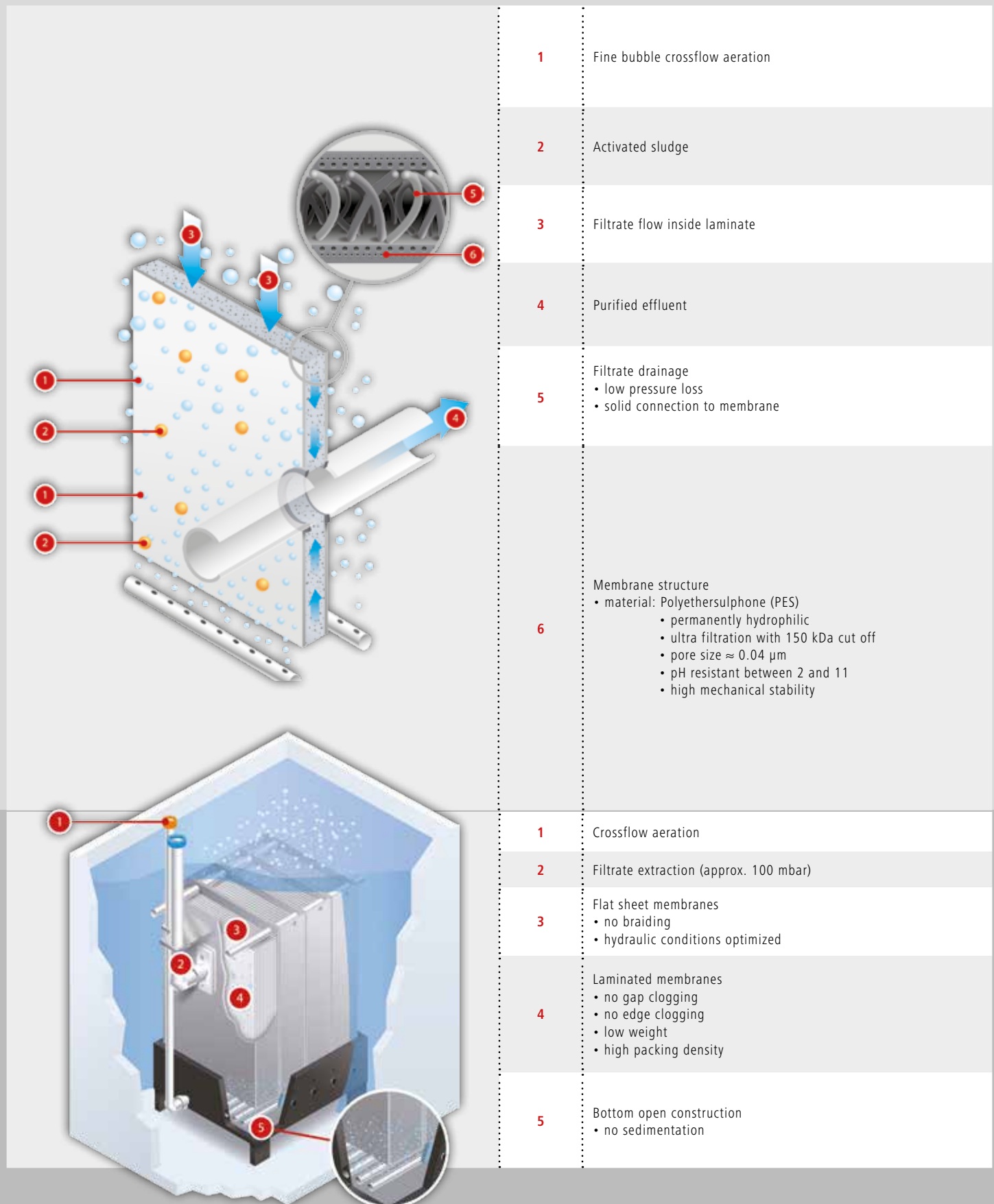
ADVANTAGES

- » physical barrier for the retention of solids and bacteria
- » module design is unsusceptible to braiding/sludge deposits
- » backwashable with filtrate or with chemicals if required
- » high packing density
- » low energy demand
- » reliable performance
- » self-healing membrane laminate
- » fine bubble aeration

The BIO-CEL® configuration is based on flat sheet technology, with crossflow inhibiting clogging and reducing downtime. The module's open top and bottom channels reliably prevent the deposition of sludge and fiber accumulation during the continuous crossflow operating process. The self-supporting structure of the membrane module enables frame-free installation, thus eliminating blockages around the external boundaries of each component. The membrane module is configured to allow for consistent permeate flow and a highly effective backflush over the entire membrane surface. In summary, the BIO-CEL® offers high packing density with optimal separation.

For large scale applications with a total inflow to the MBR plant of > 2,000 m³/d of wastewater to be treated, the BIO-CEL® XL with a total membrane area of 1,920 m² has been developed.

Design and mode of operation of the BIO-CEL® Module



BIO-CEL®

For MBR-Systems

Innovative Membrane Laminate
with Self-Healing Effect



Separation processes which are based on membrane technology are being applied more and more frequently. As membranes do not seem to be very robust per se, the question if membranes could be a suitable solution for "rough" applications arises.

Especially when considering wastewater treatment using MBRs, the integrity of the membrane plays a significant role. The actual cleaning of the wastewater in the MBR process is being performed by the biomass in the system. The membrane used must now ensure the safe separation of the biomass from the cleaned wastewater. Superficial damages to the membrane should therefore not compromise this.

If membranes are being installed in a wastewater treatment plant for many years, minor damages to the membrane cannot be avoided – may they be caused by a screwdriver or any other debris falling into the filtration chamber. Indeed membranes are "vulnerable" but when using the appropriate module construction, superficial damages to the membrane will not result in a serious problem.

ADVANTAGES

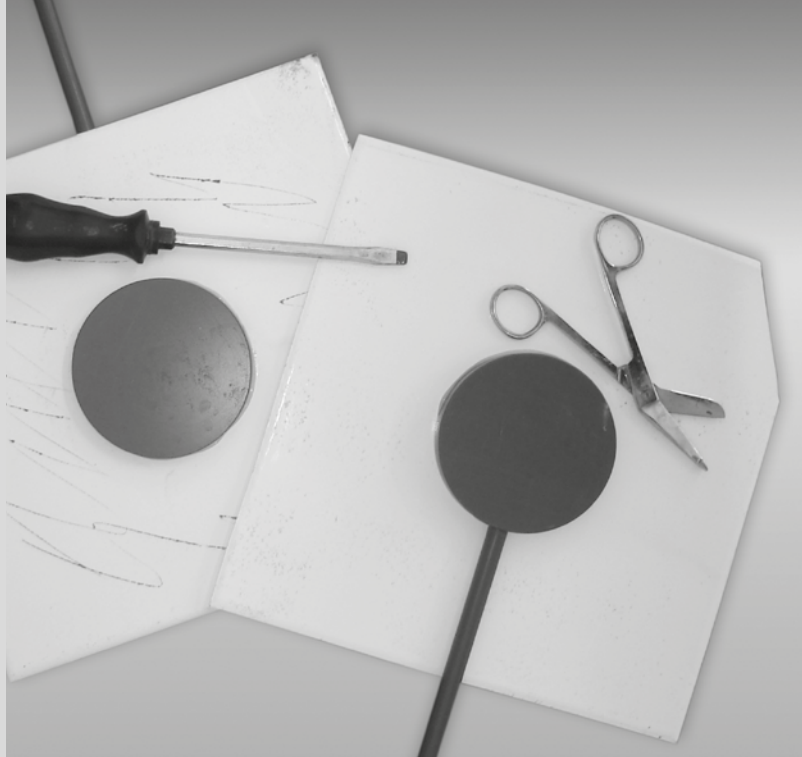
- » unique laminate structure with self-healing effect
- » effective barrier for solids and bacteria even in case of detraction of the membrane laminate
- » damages of the membrane laminate will "heal" in less than two minutes

LENNTECH

info@lennotech.com Tel. +31-152-610-900

www.lennotech.com Fax. +31-152-616-289



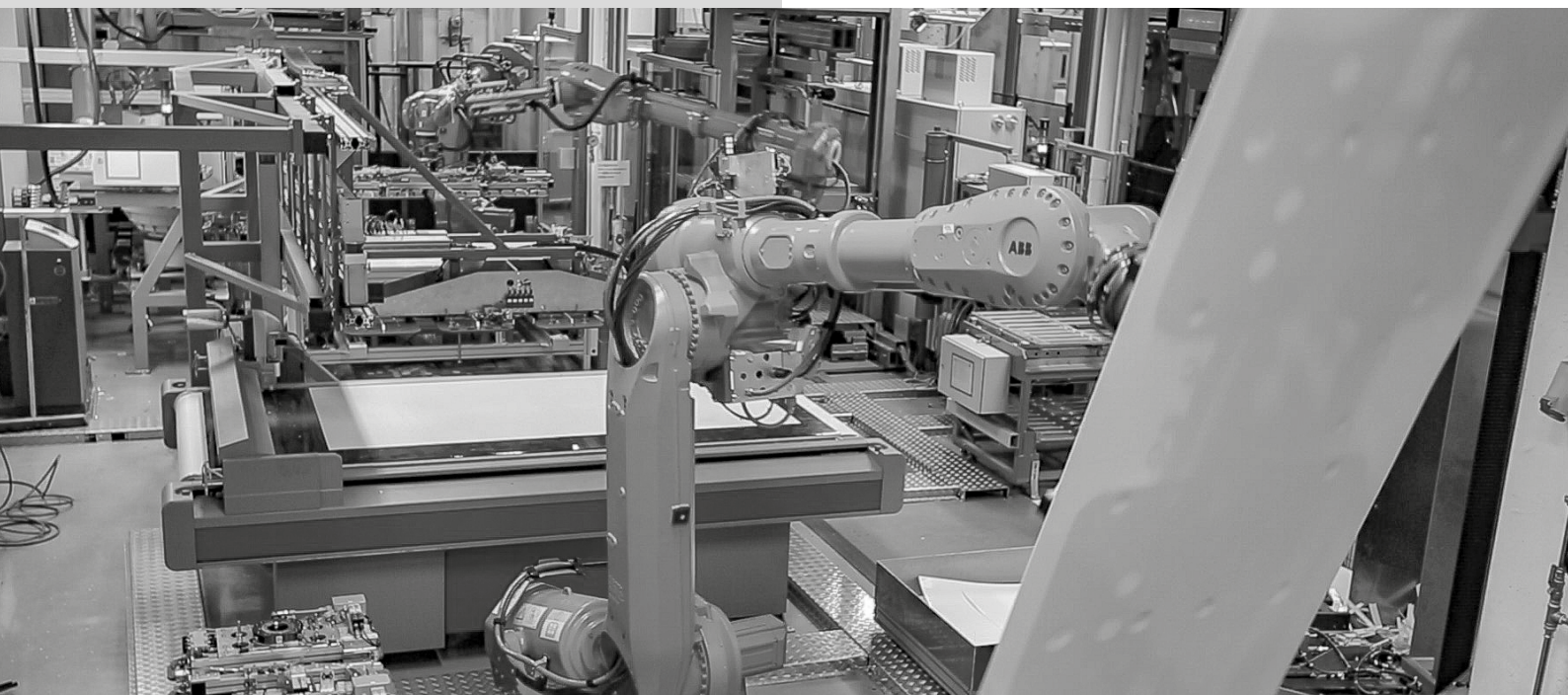
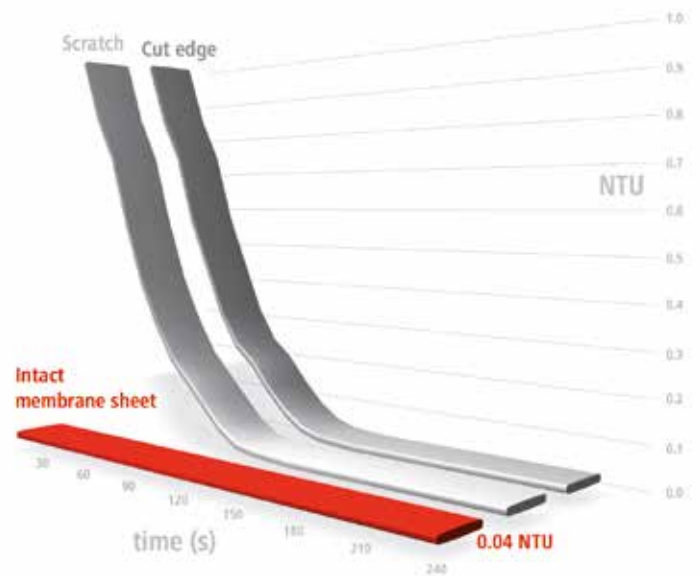


With the membrane laminate used in the BIO-CEL® module MICRODYN-NADIR has found a way to solve this problem. Instead of fixing the membrane on a mounting plate from both sides, the membrane is being laminated from two sides onto a special spacer material.

Subsequently, “laminate sheets” are being cut out of this membrane laminate and welded on the sides. The suction of the clear filtrate is done through a permeate hole in the center of the sheet.

In case of damage caused to the membrane the spacer material allows for a sealing of the damage through the help of the biomass in the system. Even after the occurrence of a severe detracton of the membrane laminate, solids and bacteria can still be rejected by the membrane laminate.

Laboratory tests have proven that the membrane laminate “heals” itself in less than two minutes even under worst case conditions.





BIO-CEL®-MCP

Mechanical Cleaning Process

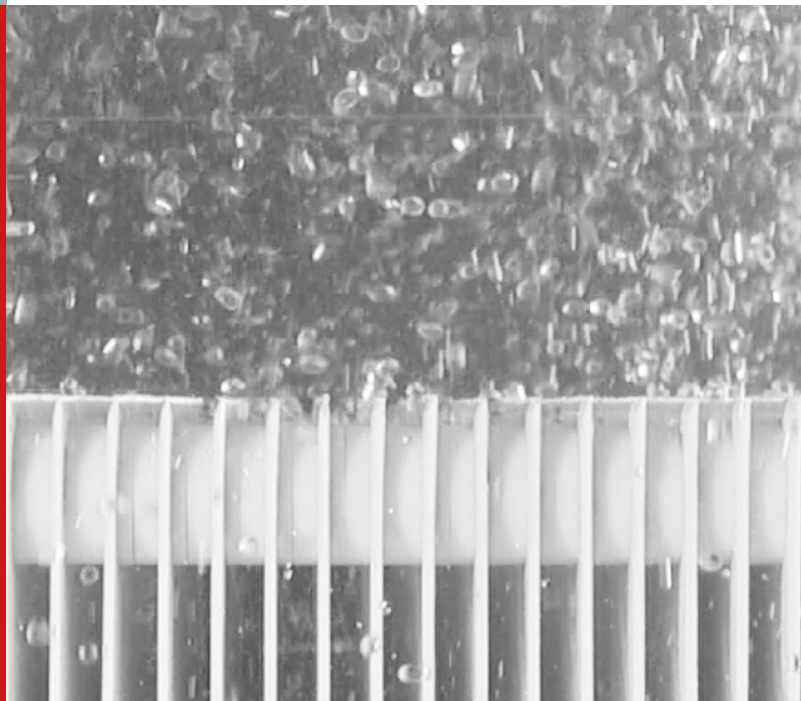
The MBR process is the most advanced wastewater treatment process currently available. The submerged BIO-CEL® membrane modules replace space-intensive secondary clarifiers and safely separate the purified wastewater from the biomass. MBR systems offer many advantages over conventional systems, namely the excellent effluent quality and minimal footprint.

In this MBR process, the submerged BIO-CEL® ultrafiltration membranes are protected against membrane fouling in a multi-stage process. Besides the process-integrated aeration (cross-flow along the membranes) and periodic backflushing/relaxation phases, chemical cleaning may also be used to reduce the fouling layer. The chemicals effectively clean the membrane surface, thereby restoring its original permeability and enabling stable and reliable process operation.

As a further process-integrated feature, the BIO-CEL® membrane module can also be cleaned mechanically, through the use of the patented BIO-CEL®-MCP (Mechanical Cleaning Process) which helps to reduce operating costs. Long-term experience shows, that a chemical free operation is possible. This innovative process reduces the formation of a fouling layer. The membrane cleaning process is being supported by the crossflow aeration and the use of the cleaning efficiency of inert, organic material (MCP granulate).

ADVANTAGES

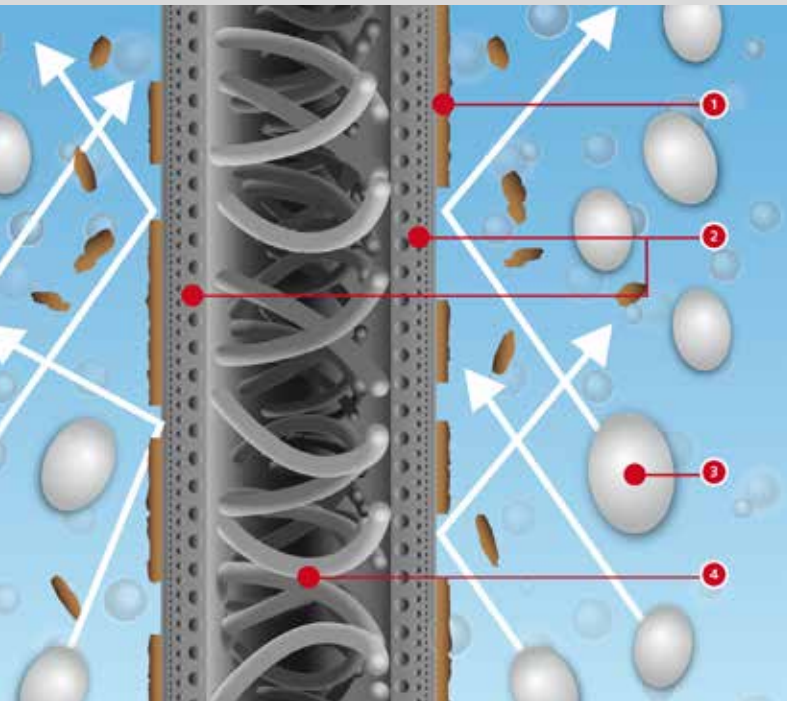
- » improved operating stability
- » simple, mechanical membrane cleaning
- » cost savings
- » performance significantly better than „conventional“ MBR systems
- » higher peak flow over longer periods of time
- » maximum system availability
- » optimized energy consumption
- » minimized chemical demand





The MCP granulate is added directly into the activated sludge. The airflow induced by the module-integrated membrane aeration system draws the MCP granulate up between the membrane sheets. As the MCP granulate rises, the membrane area is continually cleaned through the direct contact of the granulate with the sludge on the membrane surface. The fouling layer formed during the filtration process can be removed reliably without compromising the functionality of the membrane. In the downstream area outside the membrane modules, the current draws the granulate back to the base of the module where it enters again into the upstream flow. The MCP granulate has been designed for permanent usage. It is retained in the filtration tank by suitable separation systems.

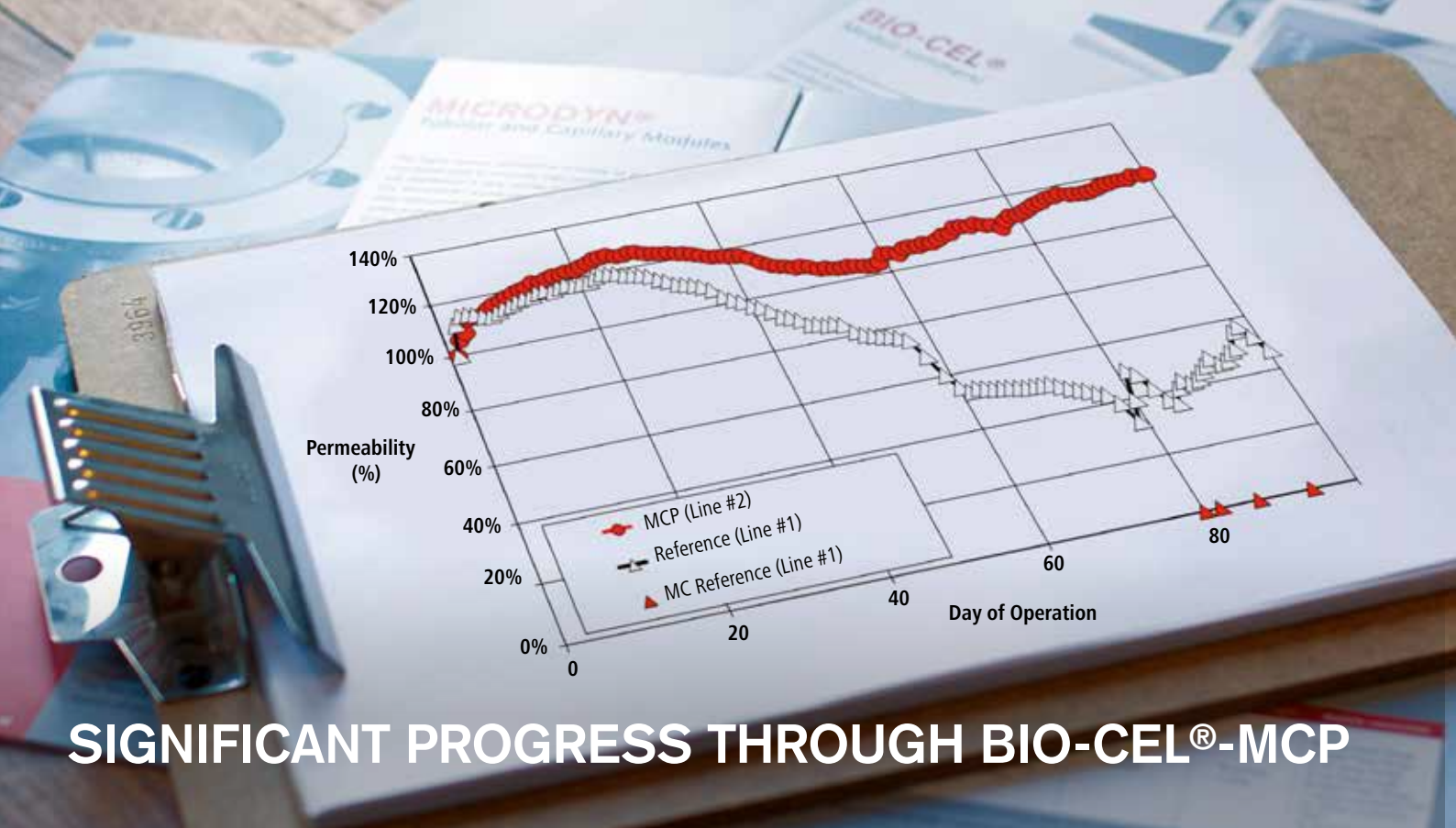
This mechanical cleaning can only be used in conjunction with BIO-CEL® modules, because other module types do not incorporate the required constructional and hydraulic characteristics to perform a mechanical cleaning.



BIO-CEL®-MCP (Mechanical Cleaning Process)

1	Cover layer
2	Membrane
3	Granulate
4	Drainage layer

Note: The Mechanical Cleaning Process (MCP) for BIO-CEL® membrane bio reactors was developed by MICRODYN-NADIR (S. Krause), Darmstadt Technical University (Peter Cornel) and Osnabrueck University of Applied Sciences (Frank P. Helmus and Sandra Rosenberger).



SIGNIFICANT PROGRESS THROUGH BIO-CEL®-MCP

One of the main advancements through the use of BIO-CEL®-MCP is the reduction of operating costs of the MBR plants.

50-70% of the whole energy demand of MBR systems is needed for the crossflow aeration, which is incurred independently of the specific flux. The BIO-CEL®-MCP system enables much higher specific flows than conventional operations, which results in a minimization of the energy demand. Moreover, investment costs are decreasing due to the reduction of the membrane area which can be achieved through the enhancement of flux. This drastically lowers investment costs (smaller membrane area needed) and reduces energy consumption (crossflow) for the entire system.

The membrane laminate's self-supporting structure allows for chemical as well as mechanical cleaning of the membrane surface, thereby ensuring permanently high membrane system availability. Test results show that no chemical membrane cleaning has been necessary for a two year period through the application of BIO-CEL®-MCP.

The chart below outlines the advantages of the application of a BIO-CEL®-MCP, using the example of a model wastewater treatment plant designed for 10,000 PE (2,000 m³/d). The annual costs can be reduced by almost 30 % through the use of MCP.

Comparative values of BIO-CEL® vs. BIO-CEL®-MCP for a model wastewater treatment plant for 10,000 PE:

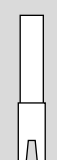
	BIO-CEL®	BIO-CEL®-MCP
Average flux ¹⁾	13.9 l/m²h	16.5 l/m²h
Peak Flux ¹⁾	27.8 l/m²h	33.0 l/m²h
Membrane area needed	6,000 m²	5,000 m²
Lifetime	8a	8a
Annual charges "Membrane Invest"	33,750 €/a	28,125 €/a
Energy demand	365,000 kWh/a	280,769 kWh/a
Annual charges "energy"²⁾	36,500 €/a	28,077 €/a
Annual charges "chemical cleaning" ³⁾	15,075 €/a	0 €/a
Annual charges "MCP"	0 €/a	5,863 €/a
Annual charges "total" (incl. invest)	85,325 €/a	62,065 €/a

(1) the assumed flux is based on the minimum achievable performance improvement through the application of MCP
 (2) valid for energy costs of 0.10 Euro per kWh / (3) assumption: no chemical cleaning

BIO-CEL® Membrane Material

Polymer	Membrane Type	MWCO	Pore Size	Support Layer	Drainage	Chlorine Resistance
Polyethersulfone (PES)	Ultrafiltration	150 kDa	0.04 µm	Polyester	Polyester	500 000 ppmh

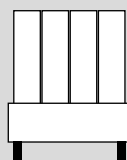
BIO-CEL® Module and Operating Data



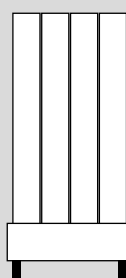
BC10



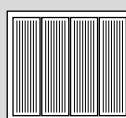
BC50



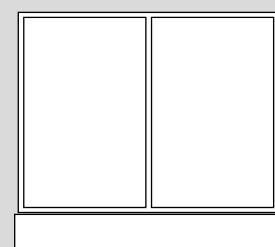
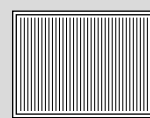
BC100



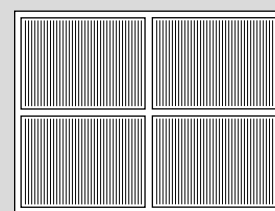
BC416



BC L-1



BC XL-1



Parameters	BC XS-1 ¹⁾	BC50	BC100	BC416 ²⁾	BC L-1 ²⁾	BC XL-1 ²⁾
Membrane surface	10 m ²	50 m ²	100 m ²	416 m ²	480 m ²	1920 m ²
Frame material operation unit	PVC	PE	PE	PE	Stainless Steel	Stainless Steel
Frame material membrane unit	PVC	PVC	PVC	PVC	Stainless Steel	Stainless Steel
Dimensions [mm]	747 x 280 x 1515	702 x 694 x 1563	702 x 1270 x 1563	1152 x 1298 x 2763	1107 x 1514 x 2530	2106 x 2786 x 2450
Operating pressure	-30 to -400 mbar	-30 to -400 mbar	-30 to -400 mbar	-30 to -400 mbar	-30 to -400 mbar	-30 to -400 mbar
Max. Backwash pressure	150 mbar	150 mbar	150 mbar	150 mbar	150 mbar	150 mbar
Max. operating temperature	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
pH-range	2 – 11	2 – 11	2 – 11	2 – 11	2 – 11	2 – 11
Max. air flow rate (Vn) ³⁾	6 m ³ /h	30 m ³ /h	60 m ³ /h	105 m ³ /h	115 m ³ /h	460 m ³ /h
Recommended content suspended solids (SS) ⁴⁾	12 g/L	12 g/L	12 g/L	12 g/L	12 g/L	12 g/L
Frame Size	10 m ²	50 m ²	100 m ²	416 m ²	480 m ²	1920 m ²
Size Cassette / Membrane Unit	10 m ²	50 m ²	25 m ²	104 m ²	480 m ²	480 m ²

Note: (1) Only for piloting purposes // (2) Excluding extra feet // (3) Vn is the volume flow rate at standard conditions according to DIN ISO 2533:1979-12 //

(4) Other concentrations possible. Please consult your MICRODYN-NADIR representative

Final sizing and selection has to be approved by an official MICRODYN-NADIR representative. Please contact **phone + 49 611 962 6001** or **www.microdyn-nadir.de**

i 1 m² ≙ 10.764 ft² | 1L ≙ 0.26 us-gal. | 1" ≙ 2.54 cm



AQUADYN®

Hollow Fiber Modules

The conventional treatment of water is based on a multi-step process including pre-filtration, precipitation/flocculation/coagulation, sedimentation, sand filtration and finally disinfection. Despite this complex process technology a constant effluent quality at raw water deviations is not always possible. Therefore, the dosage of additives needs to be adjusted which could result in high operating costs. Physical separation processes, on the other hand, display another wastewater treatment option. Especially ultrafiltration is an established technology with respect to environmentally friendly and almost residue-free water treatment processes. The AQUADYN® hollow fiber modules with their hydrophilic low fouling – high flux membranes are excellent solutions for the efficient treatment of large volumes of water. The double asymmetric hollow fiber membranes offer another advantage over single asymmetric membranes. Bacteria, solids and turbidity can be rejected effectively due to a filtration layer inside and outside the hollow fiber. Therefore, problems such as pore clogging during backflush do not occur.

Furthermore, they feature following advantages over alternative processes:

Plant Structure

- » compact design allows for smaller plant sizes
- » high level of automation possible

Plant Operation

- » easy pre-treatment even at high raw water turbidity
- » continuously high and stable permeate performance
- » modular construction provides high flexibility for fluctuations in water demand
- » high recovery rates
- » minimal cleaning demand resulting in:
 - less permeate consumption for cleaning
 - high operational availability
- » low operating costs

ADVANTAGES

- » high flow rates (high hydrophilicity)
- » high and stable permeate performance
- » most reliable process
(double asymmetric hollow fiber membranes)
- » effective retention of particles and bacteria
- » easy pre-treatment (100µm)
- » compact installation
- » high productivity
- » flexible flushing modes
- » low chemical demand

Applications

- » effluent treatment after biological wastewater plants
- » pre-treatment to reverse osmosis
(sea water and brackish water desalination)
- » stormwater treatment
- » surface water treatment
- » borehole water treatment
- » karst water filtration
- » drinking water filtration

Product Range AQUADYN® Hollow Fiber Modules

Module Type ¹⁾	Membrane Polymer	Poresize [µm]	Hollow-Fiber Diameter OD/ID [mm]	Membrane Surface [m²]	Module Length [mm]	Module Diameter [mm]	Flow Type	Type of Filtration	Regeneration	Max. Transmembrane-pressure [bar]	Max. Temperature [°C]
UA420-BT	PAN	0.025	2.1 / 1.1	6	604	160	Out/In	Dead End	-	3	45
UA640	PAN	0.025	2.1 / 1.1	16	1210	168	Out/In	Dead End	Backflush, Air Scouring	1	45
UA860	PAN	0.025	2.1 / 1.1	45	1642	216	Out/In	Dead End	Backflush, Air Scouring	1	45
UA1060	PAN	0.025	1.7 / 0.9	60	1737	267	Out/In	Dead End	Backflush, Forward Flush, Air Scouring	1	45
UE1060 ²⁾	PES	0.025	1.55 / 0.95	55	1737	267	Out/In	Dead End	Backflush, Forward Flush, Air Scouring	1	45
FT50-FUC-1582	CTA	0.01	1.3 / 0.8	50	1360	272	In/Out	Dead End	Backflush	2	40

Note: (1) Only the information given in the data sheets of the single products are binding.
(2) NSF Approval

AQUADYN® Ultrafiltration Modules

Decoding of the product code:

U A 10 60
U E 10 60

Type	Fiber Arrangement	Membrane Material	Ø Module [mm]	Module length [mm]
UA420-BT	U-Shape	PAN	160	604
UA640	U-Shape	PAN	168	1210
UA860	U-Shape	PAN	216	1642
UA1060	U-Shape	PAN	267	1737
UE1060	U-Shape	PES	267	1737

Decoding of the product code: FT50 FUC1582

Module Type	Membrane Polymer	Membrane Code
FT50	CTA (cellulose triacetate)	1582



SPIRA-CEL®

Spiral Wound Modules

Spiral wound modules have a great variety of potential combinations and consequently this module type is the most common in filtration plants.

They are used in applications ranging from the beverage, food and the pharmaceutical industry to environmental and biotechnological processes. The modules are used to separate particles like colloids, proteins and micro-organisms and to decontaminate fluids.

SPIRA-CEL® spiral wound modules are available with all types of NADIR® membranes (microfiltration, ultrafiltration, nanofiltration). They have a compact design and offer an optimum surface-area-to-volume ratio. The feed channel height can be varied by the thickness of the spacer material (from 30 to 80 mil). This allows to adapt to different levels of viscosity or solids content of the liquid. This design feature leads to excellent hydrodynamics in combination with low energy demand.

SPIRA-CEL® spiral wound modules have an outstandingly high stability against temperature and pH. They can be used to clean both caustics and acids. They can also be used in biotechnological applications where extreme cleaning conditions are required.

In addition to the SPIRA-CEL®-OX type modules (pH range of 3-14, and operating temperature of 80 °C) SPIRA-CEL®-OY type modules are now available with a pH range of 0-12 and operating temperature of 80 °C. These module types are offered with polyethersulfone membranes in micro-, ultra- and nanofiltration ranges.

MICRODYN-NADIR's SPIRA-CEL® modules are readily available in different constructions depending on the area of application: Process industry, biotechnological processes and food industry.

ADVANTAGES

- » high packing density
- » available in sanitary and non-sanitary design for different applications
- » high thermal and chemical resistance
- » high quality standard
- » economic and simple module replacement
- » various choices of module dimensions

LENNTECH

info@lennotech.com Tel. +31-152-610-900
www.lennotech.com Fax. +31-152-616-289

Total Membrane Area SPIRA-CEL®

Size of SPIRA-CEL® spiral wound modules in m²

Feed-Spacer	Module Size					
	2440	3838	4040	4333	6338	8040
30 mil		7.0	7.5	7.6	20.5	32.0
44 mil ¹⁾	1.8	5.7	6.0	6.3	17.1	25.0
65 mil	0.8		5.2	4.9	12.9	19.9
80 mil		4.0	4.2	4.3	11.5	16.5

Note: (1) For most applications the 44 mil Feed-Spacer is the most suitable.

Possible Combinations of SPIRA-CEL® Spiral Wound Modules

Sanitary Modules* for Food, Pharma and Biotech Processes

Decoding of the product code: **DS-UP020-6338C1**

Module Type	Material Group	NADIR® Membranes	Size	Feed-Spacer	(Internal) Execution Code
D Food/Dairy P Pharma/Biotech Type ¹⁾	S	see overview on page 11, NADIR® membranes and formats	3838 3.8" x 38" 6338 6.3" x 38" 8038 8.0" x 38" 8338 8.3" x 38"	B 30 mil Diamond C 44 mil Diamond D 44 mil Parallel E 65 mil Diamond F 80 mil Diamond G 80 mil Parallel	may be omitted

Note: (*) Suitability in your specific application needs to be confirmed by an official MICRODYN-NADIR representative. // 1) Pharma quality is only available with the clue type S

Non-Sanitary Modules for General Industrial Applications

Decoding of the product code: **GY-UP150-8040C1**

Module Type	Material Group	NADIR® Membranes	Size	Feed-Spacer	(Internal) Execution Code
G Industry GFK shell ⁽²⁾ O Industry hard shell	Y X	see overview on page 11, NADIR® membranes and formats	2440 ¹⁾ 2.4" x 40" 4040 4.0" x 40" 8040 8.0" x 40"	B 30 mil Diamond C 44 mil Diamond D 44 mil Parallel F 80 mil Diamond G 80 mil Parallel	may be omitted

Note: (1) Just available for piloting as OY-type with c-spacer // (2) no X-type available.

Non-Sanitary Modules for E-coat Filtration

Decoding of the product code: **EY-UV200-8040B1**

Module Type	Material Group	NADIR® Membranes	Size	Feed-Spacer	(Internal) Execution Code
E GFK shell F spacer wrap	Y	UV 200 (PVDF)	4040 4.0" x 40" 7640 7.6" x 40" 8040 8.0" x 40"	B 30 mil Diamond C 44 mil Diamond	may be omitted

Operating Conditions for SPIRA-CEL®

	DS-/PS-	EY-/FY-	GY-	OY- ²⁾	OX- ²⁾
Maximum operating temperature/°C	75	50	80 ¹⁾	80	80
Allowable ph-range in operation	2 – 10	2 – 11	2 – 11	0 - 12	3 – 14

Note: (1) With Poly(ether)sulfone membranes // (2) We provide these configurations only with Poly(ether)sulfone membranes.
Please note: Not all combinations are available. Other module configurations and sizes can be supplied upon request.

SEPRODYN®

Modules for Fine Filtration

SEPRODYN® filters are crossflow microfiltration modules used to separate suspended solids larger than 1.0 micron. The highly porous membrane contributes to a very high product flux and, with the ability to employ periodic backflush, stable and efficient processes are achievable.

SEPRODYN® tubular modules use a newly developed processing technique that allows membranes to be used in applications which require highly stable polymer materials. These membrane modules can be used across the entire pH-range from 0 to 14 and are especially recommended in applications that require a high resistance against abrasive substances.

SEPRODYN® membranes are self-supporting and extremely robust tubular membranes. Because of their large inner diameter of 5.5 mm, liquids with a high percentage of suspended solids can be filtered.

The tubular membranes are made of ultra-high molecular polyethylene made in a patented process by MICRODYN-NADIR. The membrane structure is symmetrical across the entire wall thickness. This ensures that the membrane separation performance is not affected when the membrane surface is damaged by abrasive material. The membranes are welded together with the housing. Since the housing and the membrane are both polyethylene a very stable bond between the membranes and the housing is achieved.

ADVANTAGES

- » extremely resistant to chemicals and abrasion
- » high packing density per module
- » filtration can be performed in both directions
- » high solids tolerance
- » backflushing with chemical solutions
- » minimized dead zones

LENNTECH

info@lenntech.com Tel. +31-152-610-900

www.lenntech.com Fax. +31-152-616-289

SEPRODYN® Membrane Characteristics

Membrane Characteristics	
Membrane geometry	Tubular
Inner diameter	5.5 mm
Membrane material	Polyethylene
Pore size	1 µm

SEPRODYN® Tubular Modules

Decoding of the product code: **SE-150-TP-1N/DF**

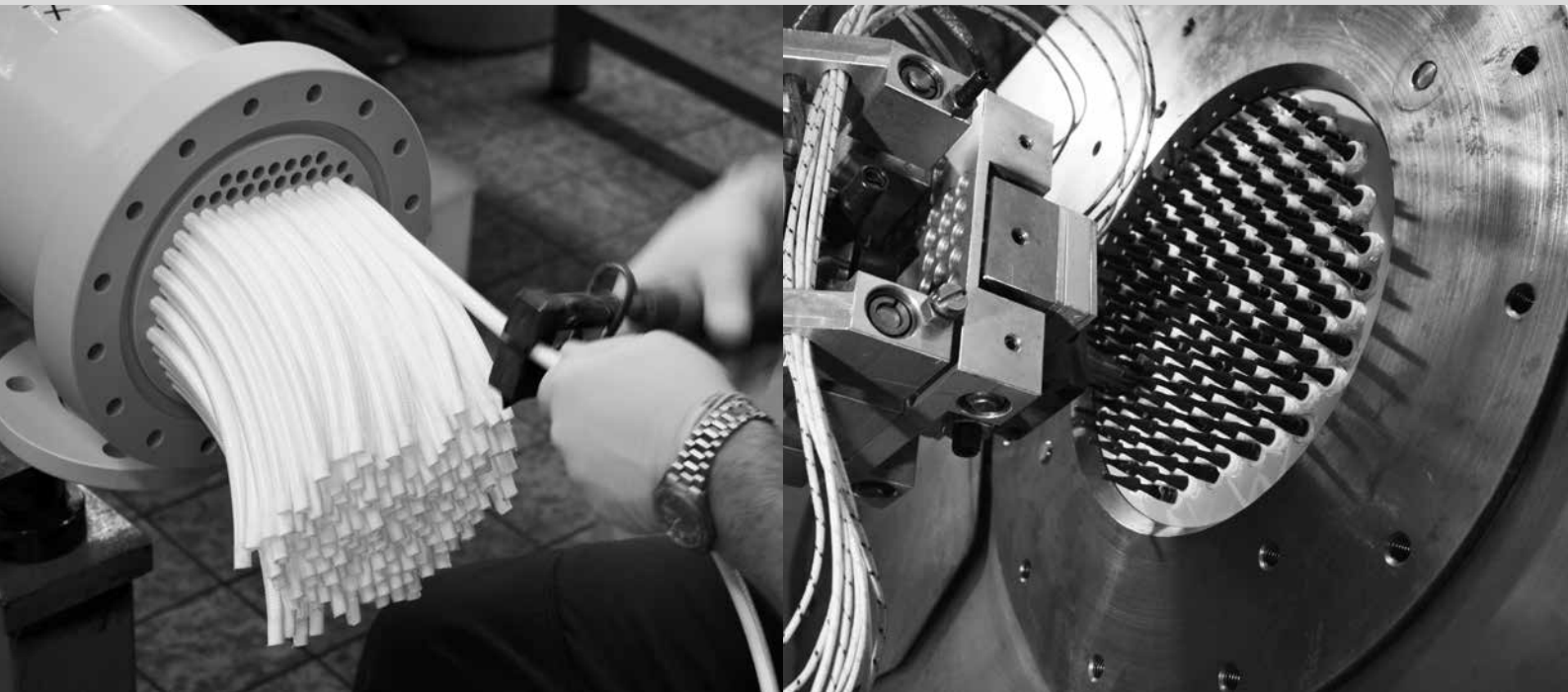
Module Type	Module Size	Membrane Geometry	Shell Material	Pore Size	Module Constr. Length	Module Connection
SEPRODYN®	(ø diameter of shell in mm) 020 laboratory module 090 module 150 module 220 module	T Tubular membrane	P Polypropylene O without shell (exchange cartridge)	1 µm	M medium N normal L long	AF: ANSI flange DF: DIN flange

Other module configurations and sizes can be supplied upon request. The connections are available according to DIN nomenclature, JIS and ANSI. Not all kinds of combinations are available. Further information can be found in our technical data sheet.

SEPRODYN® Tubular Modules

Module Type	SE 020 TP 1N	SE 090 TP 1M	SE 150 TP 1N	SE 150 TP 1L	SE 220 TP 1L
Membrane surface in m² ⁽¹⁾	0.01	1.0	4.0	8.0	16.0
Shell material	Polypropylene	Polypropylene	Polypropylene	Polypropylene	Polypropylene
Module length in m	0.75	1.40	1.65	3.00	3.10
Number of tubes	1	46	174	174	336
Crossflow for 1m/sec ⁽²⁾	71 l/h	3 200 l/h	12 300 l/h	12 300 l/h	30 000 l/h

Note: (1) Based on inner diameter // (2) Recommended flow velocity: 2-3 m/sec





MICRODYN

Tubular and Capillary Modules

MICRODYN filter modules have been developed for crossflow microfiltration. This type of crossflow microfiltration represents a modern filtration method for the separation of suspended particles or emulsified liquids.

The highly porous symmetrical structure of the MICRODYN membrane leads to extremely high permeability. The pore size distribution is very narrow making sharp separations possible. The MICRODYN membrane is very resistant to abrasion and other mechanical damage due to its homogeneous construction, unlike asymmetrically structured ceramic membranes. It also has great chemical resistance because of the material properties of polypropylene.

The membranes are available as hollow fibers, capillaries and tubes. Capillary and hollow fiber membranes are potted in the module housing. The centrifugal casting of the potting material guarantees high product quality.

Tubular membranes are welded together integrally with the housing. This makes gaskets or other sealing materials unnecessary. The modules are therefore extremely chemically stable and robust (pH range 0-14).

ADVANTAGES

- » well defined flow conditions
- » high packing density per module
- » minimized dead zones
- » extremely resistant to abrasion
- » backflushing with chemicals
- » reduced specific energy consumption

Any surface deposits formed during filtration can be easily minimized by:

- » **Adjusting the velocity of the feed flow**
- » **Periodic backwashing (PRS)**
- » **Chemical cleaning in reverse flow to the filtration flow**

These techniques result in consistently high performance levels and many years of trouble-free operation.

Polypropylene is resistant to many organic and inorganic chemicals, including most acids and caustics, with the exception of oxidants. The MICRODYN microfiltration modules can be used for the filtration of most liquids and mixtures of these chemicals.

LENNTECH

info@lennotech.com Tel. +31-152-610-900

www.lennotech.com Fax. +31-152-616-289

Overview MICRODYN Hollow Fiber Modules

Module Type	MD 070 FP 1L	MD 070 FP 2L
Membrane surface in m ² ⁽¹⁾	2.2	2.2
Membrane material	Polypropylene with 0.6 mm inner diameter	
Pore size µm	0.1	0.2
Shell material	Polypropylene cartridge	Polypropylene cartridge

Note: (1) Based on inner diameter.

Overview MICRODYN Capillary Modules

Module Type	MD 020 CP 2N	MD063 CP 2N	MD 070 CP 2L	MD 150 CP 2N	MD 150 CS 2N	MD 200 CV 2N
Membrane surface in m ² ⁽¹⁾	0.1	0.75	0.9	10	10	14
Membrane material	Polypropylene with 1.8 mm inner diameter					
Pore size µm	0.2					
Shell material	Polypropylene	Polypropylene	Polypropylene cartridge	Polypropylene	stainless steel shell	PVC shell

Note: (1) Based on inner diameter.

Overview MICRODYN Tubular Modules

Module Type	MD 020 TP 2N	MD 063 TP 2N	MD 090 TP 2N	MD 150 TP 2N	MD 150 TP 2L	MD 220 TP 2L
Membrane surface in m ² ⁽¹⁾	0.036	0.2	1	4	8	16
Membrane material	Polypropylene with 5.5 mm inner diameter					
Pore size µm	0.2					
Shell material	Polypropylene					

Note: (1) Based on inner diameter.

Decoding of the product code: MD150TP2LDF

Module Type	Module Size	Membrane Geometry	Shell Material	Pore Size	Module Length	Module Connection
MICRODYN	(∅ of the shell in mm) 020 063 070 090 150 200 220	T Tubular membrane C Capillary membrane F Hollow fiber membrane	P Polypropylene S Stainless steel 1.4571 V PVC/PVC-C U Polysulfone O without housing (exchangeable cartridge)	0.1 µm 0.2 µm	N normal L long	DL DIN Loose flange DF DIN Fixed flange JL JIS Loose flange JF JIS Fixed flange AF ANSI Fixed flange C Clamp connection F/R CC Clamp connection F/R/P AS Thread connection

Other module configurations and sizes can be supplied upon request. Not all combinations are available. The connections are available according to DIN nomenclature, JIS and ANSI. Further information can be found in our technical data sheet.



ULTRADYN

Hollow Fiber Modules

ULTRADYN hollow fiber modules are based on double asymmetric ULTRADYN membranes.

High mechanical strength and a wide range of membrane types make ULTRADYN hollow fiber modules suitable for all applications requiring a high level of purification.

Membranes are available in polyethersulfone, polyacrylonitrile and cellulose tri-acetate.

The hollow fiber inner diameters range from 0.5 to 1.4 mm, module sizes range from 0.1 m² to 17 m².

ULTRADYN hollow fiber modules have proven particularly successful in wine filtration, pure water filtration for pharmaceuticals and electronics and surface water treatment.

Additionally, ULTRADYN hollow fiber modules can be sterilized with hot water (max. 98 °C), which is an important advantage in pure water production.

ADVANTAGES

- » double asymmetric membrane
- » high filtration capacity
- » backwashable, hot water sterilisable at 98 °C
- » high chemical resistance
- » available in different types
- » high packing density

LENNTECH

info@lennotech.com Tel. +31-152-610-900
www.lennotech.com Fax. +31-152-616-289

Properties and Applications

Type	Membrane Material	Properties	Applications
FUS	Polyethersulfone	high chemical resistance, double layered	pure water, pharmaceuticals, electronics, wine filtrations, vinegar and juice filtration
FUY	Modified Polyacrylonitrile	hydrophilic, double layered	juice filtration, pharmaceuticals
FUC	Cellulose triacetate	extremely hydrophilic, double layered	water treatment

DAICEN Membrane Systems Ltd. is the manufacturer of the ULTRADYN modules and markets and distributes them under the registered trademark MOLSEP®.

Product Range ULTRADYN Hollow Fiber Modules

Decoding of the product code **FS10-FS FUS 0353**

Module Type (application)	Membrane Polymers	Type	Hollow Fiber- Inner Diameter [mm]	Membrane Surface [m ²]	MWCO [kDa]	Module Length [mm]	Crossflow for 1 m/s [l/h]	Max. Trans- membrane- Pressure [bar]	Max. Temperature [°C]	Connections
FB-02-FC Laboratory testing for all applications	FUS	0353	0.5	0.50	30	364	880	3	98	PF 1/2" Permeate clamps on the same side
	FUS	0382	0.8	0.25	30	364	690	3	98	
	FUS	1582	0.8	0.25	150	364	690	3	98	
	FUS	5082	0.8	0.25	500	364	690	3	98	
	FUY	03A1	1.0	0.20	30	364	710	3	45	
FS 03-FC Laboratory and pilot testing for all applications	FUS	0353	0.5	2.2	30	406	3 700	3	98	Feed/ Retentate: 1" Clamp ¹⁾ Permeate: PF 1/2" Permeate clamps on the same side
	FUS	0181	0.8	1.4	10	406	3 700	3	98	
	FUS	0382	0.8	1.4	30	406	3 800	3	98	
	FUS	1582	0.8	1.4	150	406	3 800	3	98	
FS 10-FS Photo-emulsions, juice and wine filtration, pure water for pharmaceuticals, biotechnology	FUS	T653	0.5	7.8	6	1 129	3 800	3	98	Feed/ Retentate: 2" Clamp ¹⁾ Permeate: 1" Clamp ¹⁾ (FS 10-FS on opposite side FS 10-FC: Permeate clamps on the same side)
	FUS	0181	0.8	5.0	10	1 129	3 800	3	98	
	FUS	0353	0.5	7.8	30	1 129	3 800	3	98	
	FUS	0382	0.8	5.0	30	1 129	3 800	3	98	
	FUS	1582	0.8	5.0	150	1 129	3 800	3	98	
	FUY	03A1	1.0	4.2	30	1 129	3 800	3	98	
FS 10-FC Module for water filtration	FUC	1582	0.8	5.0	150	1 129	1 200 ²⁾	2	35	Feed/ Retentate: 2" Clamp ¹⁾ Permeate: 1" Clamp ¹⁾ Permeate clamps on the same side)
FG 10-FC ultra pure water for electronics, flow from shell to lumen side	FUS	1071	0.7	8.6	100	1 126	3 500	3	98	Feed/ Permeate: V-Band coupling (116.8 mm) Retentate: Union Joint
FE 10-FC Prefiltration ultra pure water	FUS	0353	0.5	7.8	30	1 120	3 800	3	98	Feed/ Retentate: V-Band coupling (116.8 mm) Permeate: Union Joint (on the same side).
	FUS	1582	0.8	5.0	150	1 126	3 800	3	98	
FK 20 Cartridge-type for photo-emulsions, juice and wine filtration, biotechnology	FUS	0181	0.8	17	10	1 066	13 300	3	85	Depends on cartridge version
	FUS	0382	0.8	17	30	1 066	13 300	3	85	
	FUS	1582	0.8	17	150	1 066	13 300	3	85	
FN 20 Cartridge-type for water filtration	FUC	1582	0.8	16	150	1 066	3 500	2	40	Depends on cartridge version

Note: (1) Can be connected to TRI-CLAMP® fittings. // (2) for approx. 0.2 m/s // Please note: Not all combinations are available.



MAXIDYN

1" Tubular Module

The compact and light weight MAXIDYN 1" tubular modules are best suited for the filtration of solutions with high levels of suspended solids.

Due to the module construction and the materials used, high process stability can be achieved.

MAXIDYN FS 1" tubular modules are available in PES or a PVDF high performance membrane with different molecular weight cut-offs (MWCO).

The tubes can be arranged in parallel or series depending on process or system requirements.

Series designs are best suited for low feed volumes and parallel designs are recommended for solutions with a high fouling potential.

The dimensions and connections of the ready-to-mount modules have been chosen for quick and easy installation.

ADVANTAGES

- » filtration with very high solids
- » virtually no clogging
- » compact module construction
- » high chemical resistance
- » simple installation and maintenance
- » chemical and mechanical cleaning is possible

LENNTECH

info@lennotech.com Tel. +31-152-610-900

www.lennotech.com Fax. +31-152-616-289

MAXIDYN 1" Tubular Modules

Decoding of the product code: **FS 1 TM-251-FNO**

Module Type	Module Length	Membrane Characteristics	Shell Material	Sealing Material	(Internal) Execution Code
MAXIDYN 1" Tubular module	1 TM short version ca. 1 480 mm 3 TM long version ca. 2 870 mm	251 150 kDa PVDF 887 70 kDa PVDF 522 20 kDa PES 587 100 kDa PES	F PVC P C-PVC G without shell	V Viton (FPM)	may be omitted

Short module

Module Type	FS 1 TM-251	FS 1 TM-587	FS 1 TM-887	FS 1 TM-522
Membrane surface in m²	0.1	0.1	0.1	0.1
Membrane material	PVDF	PES	PVDF	PES
MWCO in kDa	150	100	70	20
Max. temperature in °C	FVO 45 °C // PVO 60 °C			

Long module

Module Type	FS 3 TM-251	FS 3 TM-587	FS 3 TM-887	FS 3 TM-522
Membrane surface in m²	0.2	0.2	0.2	0.2
Membrane material	PVDF	PES	PVDF	PES
MWCO in kDa	150	100	70	20
Max. temperature in °C	FVO 45 °C // PVO 60 °C			

WE SUPPORT YOU WORLDWIDE!

»

»

»

»

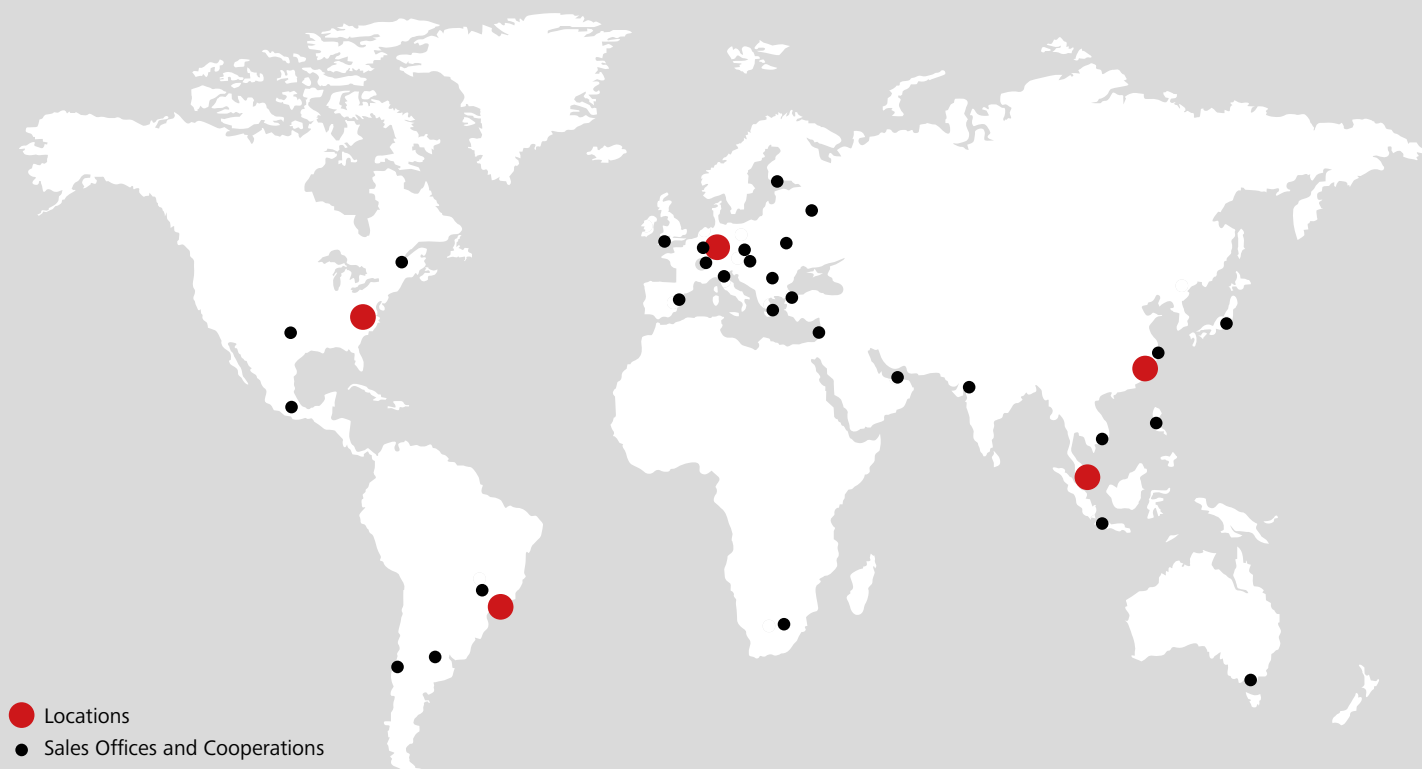
»

»

LENNTECH

info@lennotech.com Tel. +31-152-610-900

www.lennotech.com Fax. +31-152-616-289



Global availability

Intensive technical advice

Ideal choice/selection of membranes and modules

Support at construction and design phases

Laboratory and pilot scale assistance

After Sales Service



Production...

on Technologically Advanced Level

MICRODYN-NADIR has a worldwide reputation for its innovative membrane products for micro, ultra and nanofiltration. A global player today, the company maintains strong links with its origins. Its headquarters are located at the Kalle Albert Industrial Park in Wiesbaden, Germany, where the MICRODYN-NADIR story began more than 50 years ago.

Our high-quality flat sheet membranes are based on designs which were originally developed at the former Hoechst AG. They are produced in one of the world's largest membrane casting machine.

These flat sheet membranes as well as our tubular membranes and various capillary membranes are processed into a variety of membrane module types.

Our membrane and module production are maintained at a constantly high technical level. Almost all stages of the manufacturing process are automated to guarantee consistent quality which we can pass on to our customers. Our highly qualified and experienced production team places quality and quality assurance at the foundation of all our processes. Besides, the DIN EN ISO 9001:2008 certified quality control management system, clients approve our quality standards in regular company audits.

Our demands on quality and consistency equally apply to our spiral wound module production unit in China, which was successfully established in 2006. Our highly proficient R&D team is continuously developing innovative products and is always looking for new opportunities in order to assure sustainable improvement in products and processes.

This commitment to innovation is essential to open up new applications for membrane technology.

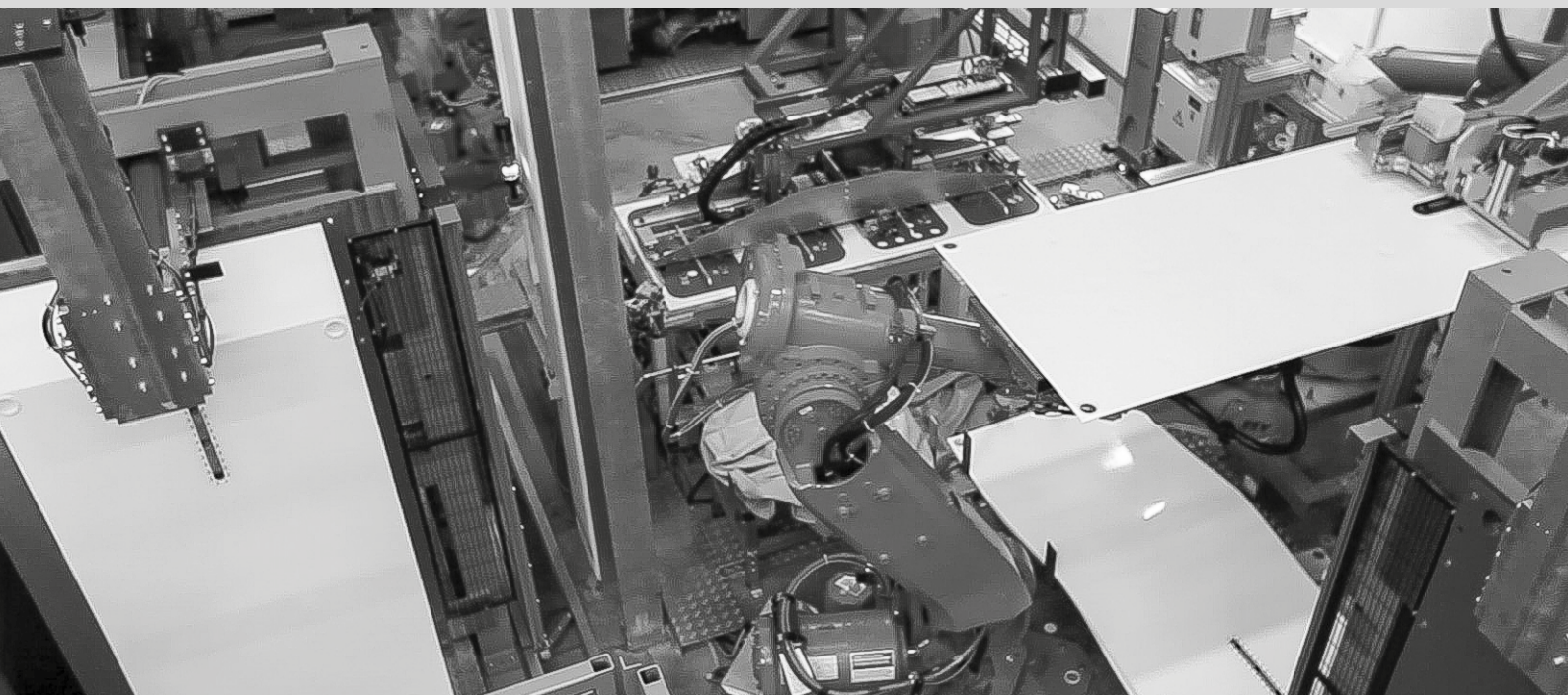
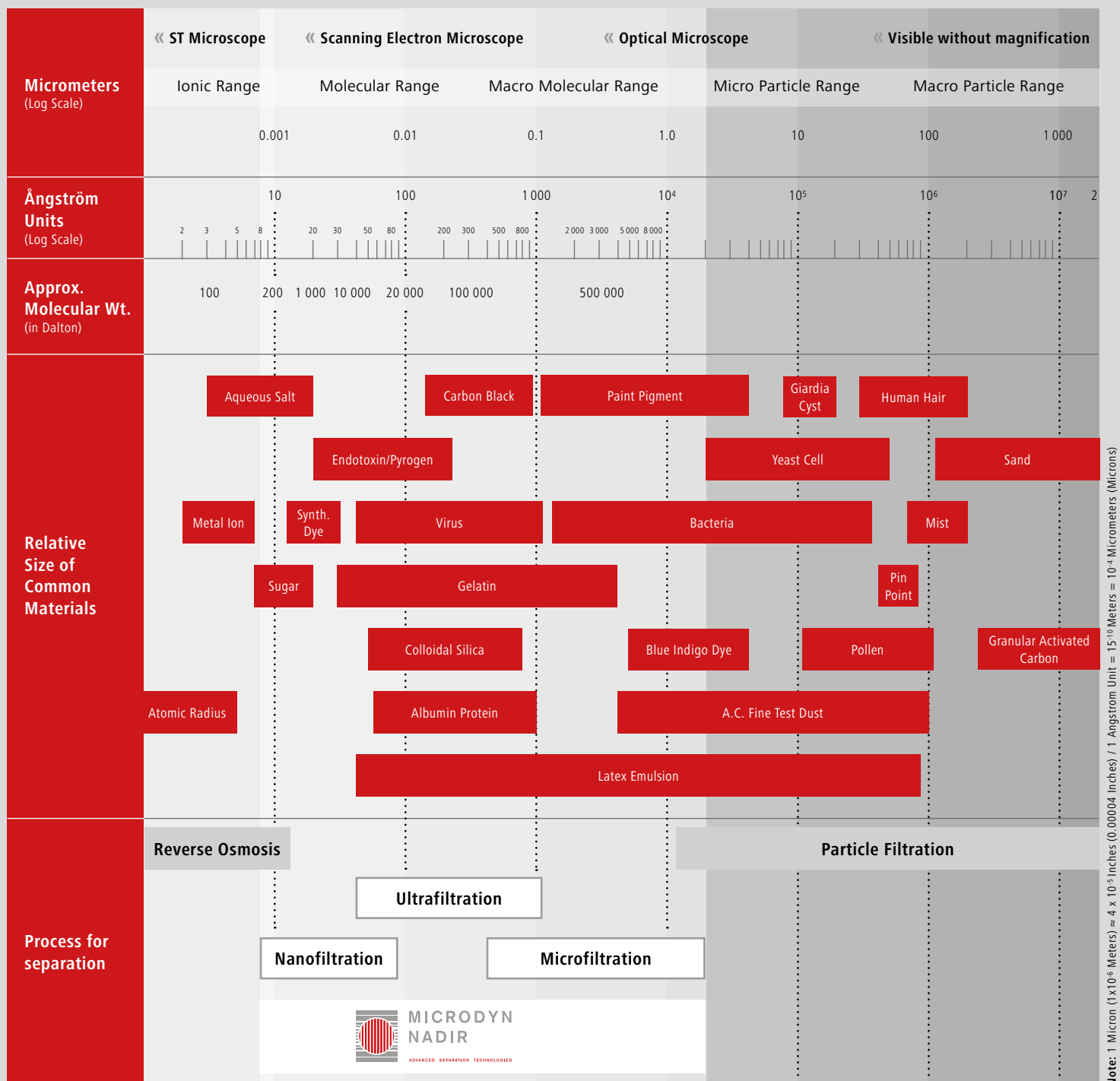
ADVANTAGES

- » more than 50 years of experience
- » own membrane production facilities
- » global player and manufacturer
- » quality control management system (DIN EN ISO 9001:2008 certified)
- » competent research and development
- » experienced and involved staff

LENNTECH

info@lennotech.com Tel. +31-152-610-900
www.lennotech.com Fax. +31-152-616-289





SEPARATION – OUR PASSION

For more than 50 years, MICRODYN-NADIR has developed innovative membranes and membrane modules for micro-, ultra- and nano-filtration as well as solutions to support our customers' needs in operation, performance, efficient membrane processes and regulatory compliance.

We will deliver products, information and services, which fully meet or exceed customer expectations. Our team focuses on continual improvement to achieve the highest possible level of customer satisfaction and to be recognized by our customers as the technology and quality leader.

We are not satisfied until our products have been successfully integrated into your customers' plants and processes. That is our passion.

Our quality system is designed to support these goals.



WE SUPPORT YOU – WORLDWIDE!

- » Global availability
- » Intensive technical consulting
- » Ideal choice of membranes and modules
- » Support with engineering and plant design
- » Laboratory and pilot tests
- » After Sales Service

LENNTECH

info@lenntech.com Tel. +31-152-610-900

www.lenntech.com Fax. +31-152-616-289



MICRODYN NADIR

ADVANCED SEPARATION TECHNOLOGIES

