

high purity

water

by MPure™ electrodeionization



Manufacturer of membranes,
modules and systems.

mega



MPure™ ELECTRODEIONIZATION

Electrodeionization (EDI) is a polishing technology to produce high purity water. It typically operates after a pretreatment and reverse osmosis process.



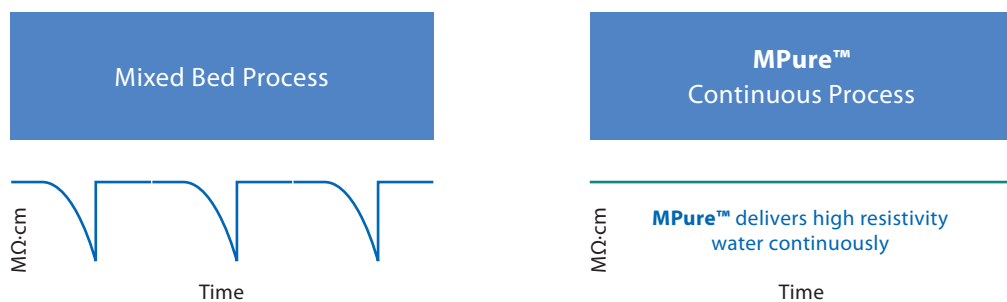
State-of-the-art high purity water production

Conventionally, Mixed Bed (MB) is the final step necessary to produce high purity water. In MB systems the cation and anion resins are regenerated using acid and caustic. EDI operates without regeneration chemicals. The elimination of bulk chemical storage and neutralization systems reduces the footprint of the water treatment system. High purity water is produced continuously at a competitive cost.

Advantages of EDI over conventional Mixed Bed technology

- Elimination of regeneration chemicals
- Simple, continuous operation
- Small footprint
- Low capital and operating cost
- Effective redundancy

The novel **MPure™** EDI modules are able to produce high resistivity water with low silica levels, making it attractive for various applications, including boiler feed water production.



Operation of Mixed Bed and EDI

THE MEGA COMPANY

30+ years of water treatment experience

MEGA provides electrodialysis solutions for RO brine concentration, application of ZLD technology and EDI equipment for ultrapure water production.

Extensive R&D is the key to continuous innovation and manufacturing of our own membranes, modules and systems. The system design is based on 30+ years of industrial experience. MPure™ Design software helps customers to evaluate possible different setups.

The story of the MEGA group reaches back to uranium mining in the former Czechoslovakia when Lubos Novak began the research of treatment of contaminated mining water. The unique membrane he had developed has proven to be the key to liquids separation in many different industries.

- GEAM, Czech Republic, 1986 – 3 m³/h
1st Industrial scale EDR application.
Uranium mining over-balanced sulfate water treatment.
- ZSNP, Slovakia, 2003 – 14,6 m³/h
1st application outside of Czech Republic. Sludge lake waste waters from aluminum processing.
- **Saudi Berkefeld, KSA, 2008 – 2 m³/h**
1st generation EDI installation
- Depurbaix, Spain, 2010 – 2000 m³/h
Largest MEGA application. Municipal waste water treatment with goal to produce water for irrigation
- **ENERGY, Czech Republic, 2014 – 3×33 m³/h**
2nd generation EDI installation
- SONNEK, Austria, 2016 – 2×5 m³/h
1st design of EDI containerized solution
- IEC, Belgium, 2016 – 1 m³/h
1st small scale EDI system using MPure6

MPure™ builds on MEGA's extensive electroseparation expertise and module manufacturing capability. The high quality MPure™ modules are produced in a state-of-the-art ISO 9001, 14001 and 18001 certified manufacturing facility.



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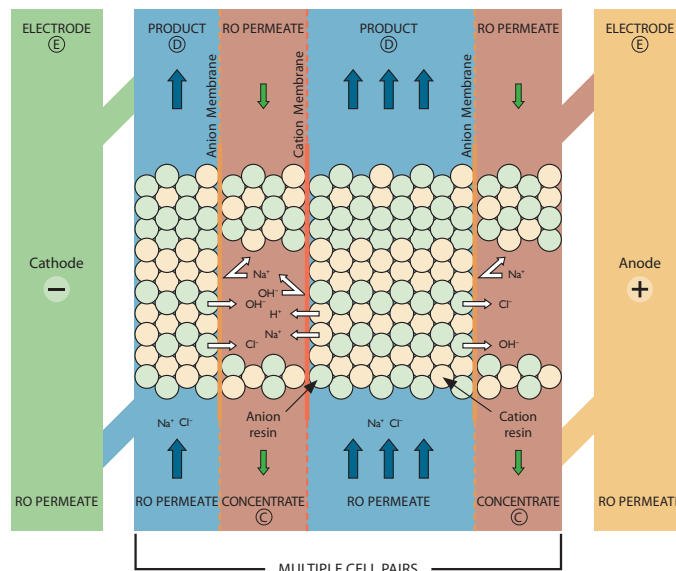


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HOW EDI WORKS

IN EDI HIGH PURITY WATER IS PRODUCED BY COMBINING ION EXCHANGE RESIN WITH ION EXCHANGE MEMBRANES INSIDE A MODULE. IONS ARE REMOVED FROM THE WATER USING A DC CURRENT. THIS DC CURRENT ALSO CONTINUOUSLY REGENERATES THE ION EXCHANGE RESIN WITHOUT USING REGENERATION CHEMICALS.

Reverse osmosis (RO) permeate enters the EDI module in the figure below. Initially ion exchange occurs with the ion exchange media in the dilute compartments. Under the influence of an applied electrical potential, ions move towards their respective electrodes. Cations in the diluting compartment move towards the cathode and pass through the cation membrane into a concentrate compartment. These cations are trapped in the concentrate compartment as they cannot pass the anion membrane. Anions move in the reverse direction towards the anode and are similarly trapped in the concentrate compartment. A small fraction of the RO permeate flushes the ions out of the concentrate compartments, producing the concentrate stream. Water splitting produces H^+ and OH^- ions providing continuous regeneration of the resin in the dilute compartments. On the concentrate side H^+ and OH^- recombine to produce H_2O .



Ion removal in **MPure™** module

The main flow is the RO permeate that is converted to high purity product water in the dilute compartment (D). A small fraction of the RO permeate is used to flush the concentrate (C) and electrode (E) compartments. The concentrate flow leaving the module contains the majority of the impurity ions present in the RO permeate. The electrode flow is a small flow of water that has been in contact with the electrode and contains impurities from the electrode reactions. Under most conditions the concentrate and electrode flows can be returned to the RO feed water tank to improve overall system recovery.

MPure™ MODULES

THE ADVANCED **MPure™** LINE OF MODULES DEVELOPED BY MEGA, THE EXPERTS IN ELECTROSEPARATION, CAN BE INTERCONNECTED TO PROVIDE HIGH FLOW BLOCKS. MODULES HAVE A ROBUST ALUMINUM ENCLOSURE. **MPure™** MODULES PRODUCE HIGH RESISTIVITY WATER WITH LOW SILICA LEVELS CONSISTENTLY.

MPure™ module features

- Industrial application modules capable to reach >16 MΩ·cm product water resistivity
- Low cost EDI system building – ports on both sides for simple interconnection, no frames for modules
- Easy maintenance – only one electrical connection, hydraulic connection with Victaulic couplings
- Modularity and redundancy – modules in the shape of cubes with different options of interconnection
- Small footprint – suitable for operation inside containers
- Robust and durable design
- Suitable for high flowrate systems
- Option for direct discharge of electrode stream



MPure™ 36, MPure™ 12, MPure™ 6



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MPure™ RECTIFIERS

MPure™ RECTIFIERS ARE OPTIMIZED FOR POWERING MPure™ MODULES. AC IS CONVERTED TO DC AT HIGH EFFICIENCY WITHOUT THE NEED FOR ISOLATION TRANSFORMERS.

In addition to the MPure™ modules, MEGA offers rectifiers to provide high quality DC power at an efficiency of 94 %. The switching mode technology delivers a DC current with a ripple of less than 3 % to ensure stable module performance. These rectifiers, which are designed for industrial applications, are supplied as modular plug-in units in a metal enclosure. Each supply is designed to power one module, which ensures optimal module operation and delivers consistent performance and reliability.

MPure™ DC Rectifiers

- High efficiency rectifier
- Low ripple
- Eliminating need for an isolation transformer
- Supply together with interface card allowing different types of communication (analog, digital). Can Bus or RS485 interface.
- 50 and 60 Hz options for different types of operators
- Low EMC and harmonic current emissions



MPure™ Rectifier

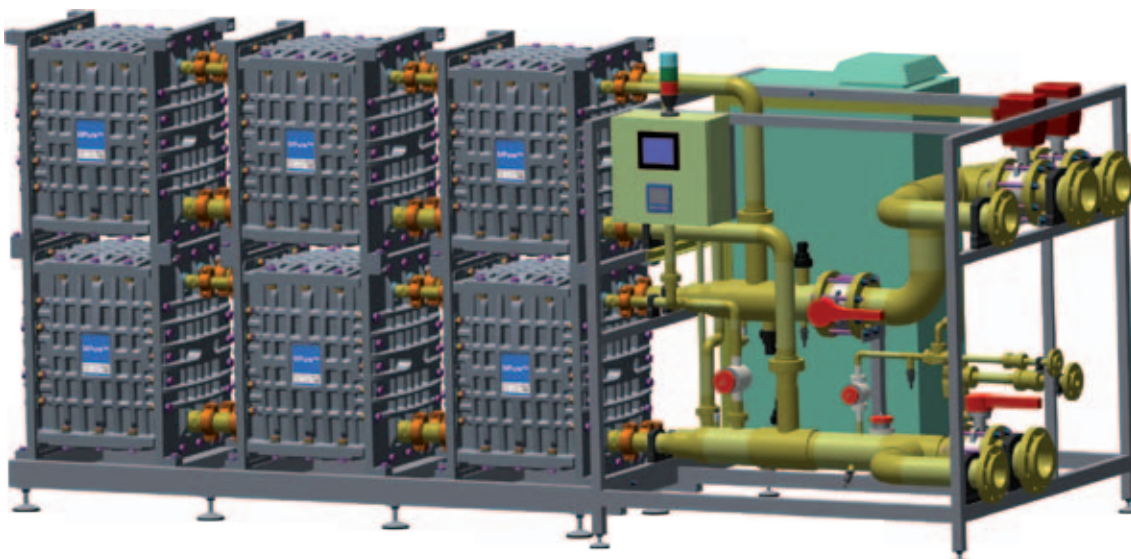
MPure™ SYSTEMS

A RANGE OF PRE-ENGINEERED SYSTEMS IS AVAILABLE TO PROVIDE SIMPLE INTEGRATION OF THE EDI STACKS INTO OVERALL WATER TREATMENT SYSTEMS. THE EQUIPMENT IS SPECIFICALLY DESIGNED TO MEET THE DEMANDS OF THE POWER, CHEMICAL AND MICROELECTRONIC INDUSTRIES.

The Ralex® HPWU range of pre-engineered systems with **MPure™** modules covers flow rates from 0.8 m³/h (22 gpm) to more than 135 m³/h (440 gpm) per system. The rugged skid mounted systems are factory assembled and tested to minimize installation and start-up costs. Systems use premium components and are delivered complete with rectifier, instrumentation and controls. Various options, including remote monitoring and control, are available to allow for easy operation and integration with pretreatment and post treatment equipment.

Features of the RALEX® HPWU systems:

- Simple and cost-effective solution with small footprint and modular design
- Tunability – separate rectifier for each module allows its tuning to its top performance
- No frames in between modules
- Modules artificially grounded – no need for grounding
- SS skid frames, PP piping
- Fully automatic with local PLC. All instrumentation data transmitted into PLC
- Possibility of high flowrate systems up to 135 m³/h
- Possibility of CIP for each line separately (D, C and E)



High flow rate **MPure™** System

ELECTRODEIONIZATION P R O C E S S

- BOILER FEED WATER
- RINSE WATER FOR ELECTRONICS
AND SEMICONDUCTOR INDUSTRY
- INDUSTRIAL PROCESS WATER

ELECTRODEIONIZATION IS THE

RIGHT SOLUTION!



ralex[®]

OFFICIAL TRADEMARK OF THE MEGA COMPANY FOR MEMBRANE PROCESSES

MEGA a.s., Straz pod Ralskem, Czech Republic

☎ +420 487 888 300

📞 +420 487 888 302

✉ sales@mega.cz

www.mega.cz/highpurity