



Technology at its highest level

LaboStar™ and Ultra Clear™ Lab Water Systems

Water Technologies

SIEMENS



LaboStar™ bench-top system



LaboStar™ wall mounted system



LaboStar™ system open

LaboStar™ Ultrapure Water Systems

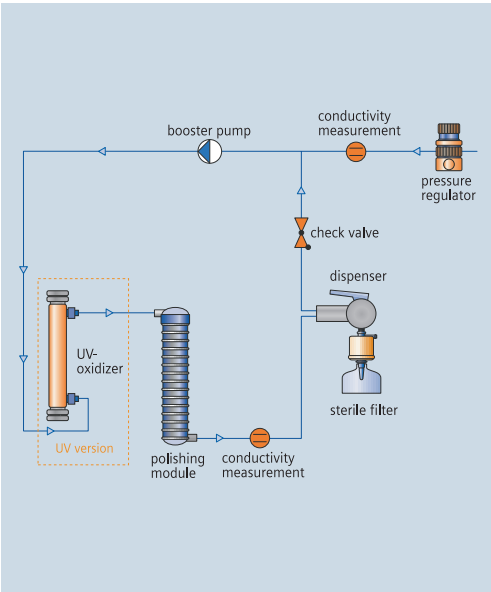
Highest water quality – economically produced.

The LaboStar™ system is a cost effective means of producing analytical grade water. This extremely compact ultrapure water system can be used on a laboratory bench or can also be mounted on the wall. The water produced by the deionized (DI) version has a conductivity of 0.055 $\mu\text{S}/\text{cm}$ (equivalent to 18.2 $\text{M}\Omega\text{-cm}$) and a TOC value of < 10 ppb. The water produced by the ultraviolet (UV) version has a TOC value of 1 – 5 ppb. This water quality exceeds all relevant standards including ASTM Type I, CLSI (Clinical Laboratory Standards Institute) and ISO 3696 Type I. The LaboStar™ system is fed with either deionized water, distilled water or permeate from a reverse osmosis unit.

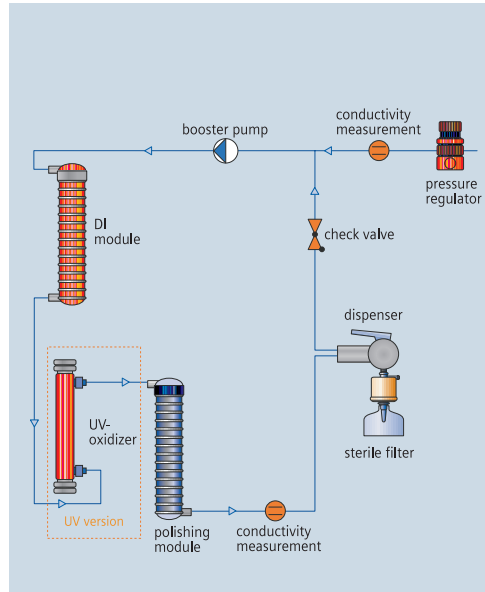
The selection of treatment materials in LaboStar™ 1 and 3 systems, along with the DI polishing modules, guarantees that the product water meets the highest quality standards. A conductivity meter in the recirculation section continually monitors the purity of the product water.

LaboStar™ System Model		1-DI/2-DI	1-UV/2-UV	3-DI/4-DI	3-UV/4-UV
Ultrapure water specifications					
Output* up to	l/min	1.5	1.5	1.5	1.5
Conductivity at 25° C	$\mu\text{S}/\text{cm}$	0.055	0.055	0.055	0.055
Resistivity at 25° C	$\text{M}\Omega\text{-cm}$	18.2	18.2	18.2	18.2
TOC	ppb	5 – 10	1 – 5	5 – 10	1 – 5
Bacteria	cfu/ml	< 1	< 1	< 1	< 1
Endotoxins with use of filter	EU/ml	< 0.001	< 0.001	< 0.001	< 0.001
Particles > 0.2 μm	per ml	< 1	< 1	< 1	< 1
Feed water specification					
Feed water pressure	bar	0 – 6	0 – 6	–	–
Feed conductivity	$\mu\text{S}/\text{cm}$	< 20	< 20	< 20	< 20
TOC	ppb	< 50	< 50	< 50	< 50
Silica	ppm	2	2	2	2
Temperature	°C	5 – 35	5 – 35	5 – 35	5 – 35
Power supply	V/Hz	100-240/50-60			
Dimensions: H/W/D	mm	535/290/320	535/290/320	535/290/400	535/290/400
Shipping weight	kg	20/21	22/23	21/22	23/24
Catalog Number		2201 / 2206	2202 / 2207	2211 / 2216	2212 / 2217
Catalog Number for wall mounting		2201-W / 2206-W	2202-W / 2207-W	2211-W / 2216-W	2212-W / 2217-W

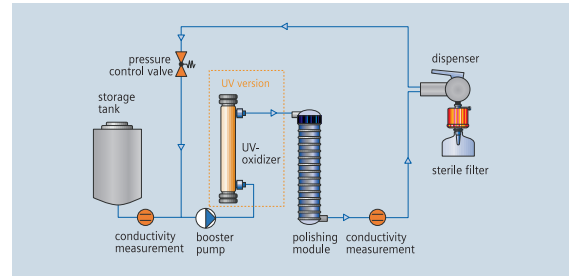
*gravity feed 1.2 l/min



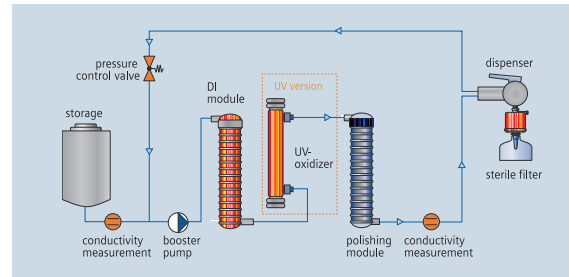
Flowsheet of LaboStar™ 1-DI/UV system



Flowsheet of LaboStar™ 2-DI/UV system



Flowsheet of LaboStar™ 3-DI/UV System



Flowsheet of LaboStar™ system 4-DI/UV

A 0.2 µm charged sterile filter at the dispenser removes bacteria and endotoxins. This makes it possible to produce pure water with an endotoxin content of <0.001 EU/ml without the need for any further investment in an ultra filter. An uncharged final filter is also available.

LaboStar™ System Advantages:

- Ultrapure water circulation right into the dispenser head
- Easy to dispense water using the practical dispenser
- Whisper operation mode
- Rapid and simple disinfection
- Conductivity monitoring of ultrapure water
- Pressure reducer included (only type 1 and 2)
- Simple module exchange via quick-release connections
- Protective jacket at the end of the sterile filter

The LaboStar™ 3 and 4 systems are mobile bench devices with an integrated tank which can be directly filled with feed water.

LaboStar™ 3 and 4 System Advantages:

- 7 liter tank volume
- Suitable for mobile use
- Ultrapure water is ready for use within minutes of filling the tank
- System can be used at different locations

LaboStar™ systems are delivered with the first set of modules and filters and are ready for use.

OPTIONS	
Item	Catalog No.
Wall Bracket (only for LaboStar 3 + 4)	2190

CONSUMABLES		
Item	Change frequency	Catalog No.
DI-module*	6 – 12 monthly	2160
UV replacement bulb**	6 monthly	2068
Polishing module		
– HP1 for low inorganic applications	6 – 12 monthly	2172
– HP2 for low organic applications	6 – 12 monthly	2173
Sterile filter (pack of 3)		
– 0.2 micron charged filter	6 monthly	2097
– 0.2 micron uncharged filter		2064-3
Disinfection kit (pack of 3)		2055

Consumable change frequency information is average and can vary.
 * for LaboStar 2 DI and 4 DI Systems
 ** for UV versions



Ultra Clear™ system on a laboratory bench



The Ultra Clear™ Integra system is a space-saving alternative for under-bench systems. A remote dispense/display station can be mounted to the wall.

Pure Purity - Ultra Clear™ Systems

TOC monitoring units with optional UV-radiation intensity measurement.
Programmable volume control dispensing included.

Ultra Clear™ System Model*		–	UV	plus	UV plus	UV TM	UV plus TM
Ultrapure water specifications							
Output** up to	l/min	2	2	2	2	2	2
Conductivity at 25° C	µS/cm	0.055	0.055	0.055	0.055	0.055	0.055
Resistivity at 25° C	MΩ-cm	18.2	18.2	18.2	18.2	18.2	18.2
TOC	ppb	5 – 10	< 1	5 – 10	< 1	< 1	< 1
DNase, RNase, DNA		–	–	–	free	–	free
Bacteria	cfu/ml	< 1	< 1	< 1	< 1	< 1	< 1
Endotoxins	EU/ml	–	–	< 0.001	< 0.001	–	< 0.001
Particles > 0.1 µm	per ml	< 1	< 1	< 1	< 1	< 1	< 1
Feed water specification							
Feed water pressure	bar	0.1 – 5	0.1 – 5	0.1 – 5	0.1 – 5	0.1 – 5	0.1 – 5
Feed conductivity	µS/cm	< 20	< 20	< 20	< 20	< 20	< 20
TOC	ppb	< 50	< 50	< 50	< 50	< 50	< 50
Shipping weight Ultra Clear/ Ultra Clear Integra	kg	24/26	25/27	25/27	26/28	26/28	26/28
Power supply	V/Hz	for all models 100 – 240 / 50 – 60					
Dimensions: H/W/D	mm	for all models 530 / 340 / 320					
Ultra Clear™ Catalog Number		2001	2002	2003	2004	2002-TM	2004-TM
Ultra Clear™ Integra Catalog Number		2005	2006	2007	2008	2006-TM	2008-TM
* The technical specifications are the same for all Ultra Clear™ systems (only the Integra model housing dimensions are slightly smaller).							
** Gravity feed 1.5 l/min							

Outstanding performance:

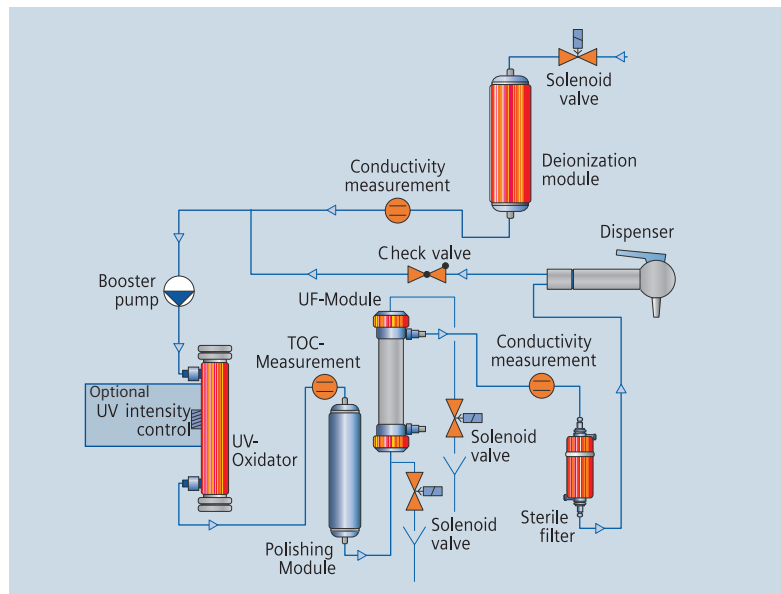
The Ultra Clear™ bench top and Ultra Clear™ Integra systems are designed for maximizing space saving in under bench installations. Each Ultra Clear™ system is equipped with economical state-of-the-art purification technology.

System includes:

- Deionization module
- Conductivity meter to measure pretreated water
- Polishing module
- 0.1 µm sterile filter in the recirculation loop

Water quality with a resistivity of 18.2 MΩ-cm and a TOC-level < 1 ppb far exceed all reagent water quality standards including: ASTM Type 1, CLSI and ISO 3696 Type 1.

All systems that include UV-oxidation, TOC monitoring and ultrafiltration produce the highest possible water quality. These units deliver RNase-, DNase- and DNA-free water.



Flowsheet of Ultra Clear™ UV Plus system



In all systems the polishing module MFIID is included. All UV systems are delivered with pretreatment module DTO and all other systems with the deionization module VMD.

Systems are also capable of producing purified water with endotoxin levels of < 0.001 EU/ml.

The dispense flow rate is up to 2 LPM of ultrapure water. The high resolution display indicates the water conductivity in $\mu\text{S}/\text{cm}$ or resistivity in $\text{M}\Omega\text{-cm}$ with the corresponding water temperature.

You can mount the Ultra Clear™ Integra system wherever there is a premium for space.

Cartridge changes are very simple and fast due to quick and easy access to the replacement parts.

A single UV-lamp is used for the oxidization of organic compounds and TOC-measurement. The energy emitted from the lamp is continuously monitored to account for declining radiation output during the lamp service life. Optional UV intensity control is available. The use of a single UV lamp results in

much lower annual running cost compared to the competition. The brilliant design with compact dimensions makes it possible to use or mount the system where space is a premium.

A flexible remote dispenser enables the user to dispense water where it is needed. A built-in automatic self-cleaning mechanism extends the life of the ultrafilter module.

Pure water dispensing is made easy by simply activating the valve lever. A continuous flow of pure water is achieved by simply placing the draw-off lever in an upright position.

Our new systems are available with special features such as volume control dispensing, a 24-hour-circulation mode with extreme low sound level < 40dba and integrated RS 232 interface for data recording. Flexible remote dispenser hoses are available at various lengths.

CONSUMABLES		
Item	Change frequency	Catalog No.
Deionization Module VMD for applications in the inorganic range	6 – 12 monthly	2050
Pretreatment Module DTO for applications that need low TOC	6 – 12 monthly	2094
Polishing Module MF III D for applications in the low TOC range	6 – 12 monthly	2051
Polishing Module ILT for inorganic applications	6 – 12 monthly	2092
Sterile filter 0.1 μm , 1000 cm^2	6 monthly	2052
Disinfection kit (pack of 3)	–	2055
UV- Replacement bulb, only for systems without TM only for systems with TM	12 monthly 12 monthly	2068 2069
UF Membrane Preventor 5000	18 – 36 monthly	2058
Consumable change frequency information is average and can vary.		

OPTIONS	
Item	Catalog No.
Dispenser hose extension on request (to be ordered together with the system, please specify the needed length)	02194-2



LaboStar™ TWF bench-top system



LaboStar™ TWF with Sterile filter (Biofilter)



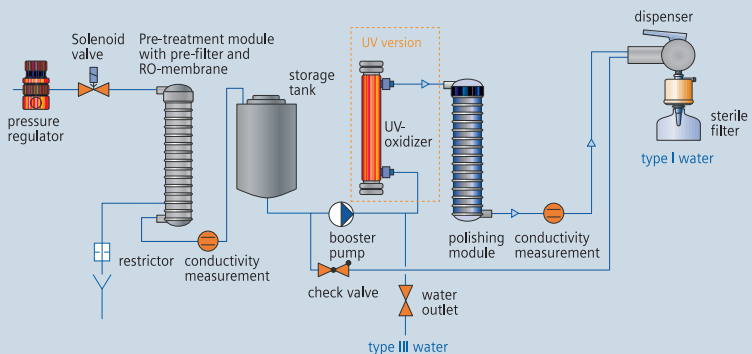
LaboStar™ TWF with 7 liter integrated tanks

LaboStar™ 3/7 TWF-DI and TWF-UV Ultrapure Water Systems

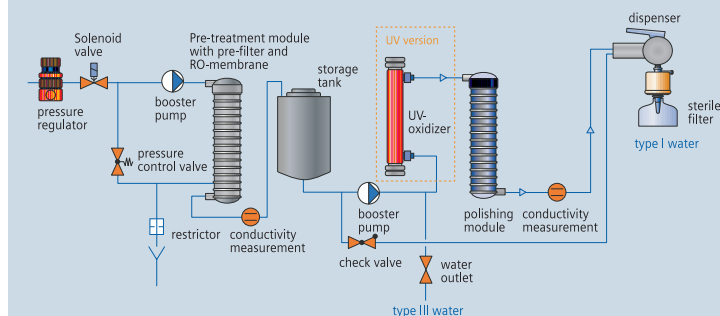
From tap to ultrapure water – only one innovative step

The LaboStar™ 3/7-TWF-DI and TWF-UV systems produce ultrapure water straight from your drinking water supply. This equipment incorporates a pre-filtration unit and a reverse osmosis membrane in one single compact module. The Type III quality reading of the reverse osmosis water appears in the display. The pure water collects in an integrated tank and is finally circulated through the polishing module by a circulation pump. The user can extract either Type III water from the tank or Type I water from the dispenser with a quality of 0.055 $\mu\text{S/cm}$, equivalent to 18.2 $\text{M}\Omega\text{-cm}$, and TOC of between 1 and 10 ppb, depending on the system type. The functionally designed LaboStar equipment can cost-effectively produce even small amounts of analytical-grade water. The water quality exceeds all relevant standards including ASTM Type I, CLSI and ISO 3696 Type I.

LaboStar™ 3/7 TWF System Models		DI	UV
Ultrapure water specifications			
Output	l/min	1.2	1.2
Permeate rate at 15°C	l/h	3/7	3/7
Conductivity at 25° C	$\mu\text{S/cm}$	0.055	0.055
Resistivity at 25° C	$\text{M}\Omega\text{-cm}$	18.2	18.2
TOC	ppb	5 – 10	1 – 5
Bacteria	cfu/ml	< 1	< 1
Endotoxins with use of our filter	EU/ml	< 0.001	< 0.001
Particles > 0.2 μm	per ml	< 1	< 1
Conductivity of input water is reduced by 98 %			
Feed water specification			
Feed water pressure	bar	3 – 5	3 – 5
Feed conductivity	$\mu\text{S/cm}$	< 1400	< 1400
Temperature	°C	5 – 35	5 – 35
Power supply	V/Hz	100-240 / 50-60	
Dimensions: H/W/D	mm	535/290/400	535/290/400
Shipping weight	kg	24	25
Catalog Number	3 l/h	2221	2222
	7 l/h	2231	2232
Catalog Number for wall mounting	3 l/h	2221-W	2222-W
	7 l/h	2231-W	2232-W



Flowsheet of LaboStar™ 3 TWF-DI/UV system



Flowsheet of LaboStar™ 7 TWF-DI/UV system

A conductivity sensor constantly measures the product water purity in the recirculation loop. A charged 0.2 µm sterile filter at the dispenser removes bacteria and endotoxins, eliminating the need for an ultra filter. An uncharged 0.2 µm final filter is also available.

LaboStar™ TWF-DI/UV System Advantages:

- Connection to municipal drinking water supply
- 7 liter tank volume
- Ultrapure water circulation right into the dispenser head
- Easy to dispense water using the practical dispenser

- Whisper mode
- Rapid and simple disinfection
- Conductivity monitoring of pre-treatment module and ultrapure water
- Simple module exchange via quick-release connections
- Protective jacket at the end of the sterile filter
- Extraction of Type III pure water also possible

LaboStar™ systems are delivered with the first set of modules and filters.



Sterile filter, 0.2 µm, with retention of endotoxin (2097).

CONSUMABLES		
Item	Change frequency	Catalog No.
Pre-treatment/RO module 3 / 7 l/h	6 – 12 monthly	2111
UV replacement bulb*	12 monthly	2068
Polishing module – HP1 for low inorganic application – HP2 for low organic application	6 – 12 monthly 6 – 12 monthly	2172 2173
Sterile filter (pack of 3) – 0.2 micron charged filter – 0.2 micron uncharged filter	6 monthly 6 monthly	2097 2064-3
Disinfection kit (pack of 3)	–	2055
Consumable change frequency information is average and can vary. * for UV versions		

OPTIONS	
Item	Catalog No.
Wall bracket	2190
Vent filter, PTFE membrane (pack of 3)	3513



Pure Water Specifications for all types	
Product rate into the tank	10 l/h*
Conductivity	< 2 µS/cm**
* 20 l/h upon request.	
** Limiting value adjustable.	



Ultra Clear™ TWF system w/ 30 liter tank

Ultra Clear™ TWF system w/ 60 liter tank

Ultra Clear™ TWF Systems

Direct Purity – Tap Water Feed

Deionized and ultrapure water obtainable from a single system

The Ultra Clear™ TWF system is equipped with all the necessary components to produce reagent grade water directly from municipal tap water. The built-in reverse osmosis system has a recovery rate of > 30% to conserve water.

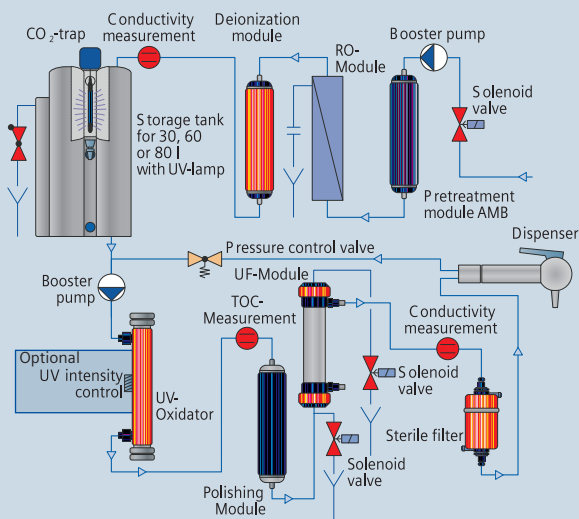
The downstream deionization module polishes the RO product water prior to delivery to the storage tank. Water going to storage has a quality of < 2µS/cm.

The Ultra Clear™ TWF systems have a dispense rate of up to 1.8 LPM with a water quality of 18.2 MΩ-cm and a TOC-level of <1ppb.

The system exceeds all reagent grade water quality standards including: ASTM Type 1, CLSI and ISO 3696 Type 1.

Options include: ultrafiltration, UV-oxidation and TOC monitoring with intensity measurement (optional) for any

Ultra Clear™ TWF Models		–	UV	plus	UV plus	UV TM	UV plus TM
Ultrapure water specifications							
Output up to	l/min	1.8	1.8	1.8	1.8	1.8	1.8
Conductivity at 25° C	µS/cm	0.055	0.055	0.055	0.055	0.055	0.055
Resistivity at 25° C	MΩ-cm	18.2	18.2	18.2	18.2	18.2	18.2
TOC	ppb	5 – 10	< 1	5 – 10	< 1	< 1	< 1
DNase, RNase, DNA		–	–	–	free	–	free
Bacteria	cfu/ml	< 1	< 1	< 1	< 1	< 1	< 1
Endotoxins	EU/ml	–	–	< 0.001	< 0.001	–	< 0.001
Particles > 0.1 µm	per ml	< 1	< 1	< 1	< 1	< 1	< 1
Feed water specification							
Feed water pressure	bar	0 – 5	0 – 5	0 – 5	0 – 5	0 – 5	0 – 5
Feed conductivity	µS/cm	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000
Colloid index SDI		< 3	< 3	< 3	< 3	< 3	< 3
Free Chlorine	mg/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fe	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Shipping weight 30 l / 60 l / 80 l	kg	41/44/56	42/45/57	42/45/57	44/47/57	43/46/58	44/47/59
Power supply	V/Hz	for all models 100 – 240 / 50 – 60					
Dimensions: H/W/D	mm	30 l tank: 530 / 560 / 320 60 l tank: 530 / 900 / 320 80 l tank: 1340 / 340 / 580					
Catalog Number for 30 l tank systems		2001-D	2002-D	2003-D	2004-D	2002-TM-D	2004-TM-D
Catalog Number for 60 l tank systems		2001-D/60	2002-D/60	2003-D/60	2004-D/60	2002-TM-D/60	2004-TM-D/60
Catalog Number for 80 l tank systems		2001-D/80	2002-D/80	2003-D/80	2004-D/80	2002-TM-D/80	2004-TM-D/80



Flowsheet of Ultra Clear™ TWF UV plus TM system



Ultra Clear™ system with 80 liter tank

OPTIONS	
Item	Catalog No.
Bracket ET 30 for 30 l tank including screws and plugs	3317
Bracket ET 60 for 60 l tank including screws and plugs	3318
Dispenser hose extension on request (to be ordered together with the system, please specify the needed length)	02194-2
Extra 80 l tank booster pump for washing machine feed (to be ordered together with the system) With 5" 0.2 µm filter Without filter	3356-1 3356-2

application.

Pretreatment, reverse osmosis module, deionization cartridge, storage tank, UV-oxidization chamber, polisher, ultrafilter and sterile filter are all integrated into one system. The system delivers ultrapure water which is RNase-, DNase- and DNA-free. Endotoxin content is extremely low at < 0.001 EU/ml.

This compact system has been successfully developed with all the required technical features to economically produce purified and ultrapure water with low running costs. Other systems consisting of separate reverse osmosis unit, storage tank and polishing unit are typically expensive.

An automatic flushing mechanism for the ultrafilter extends the service life.

Cartridge changes are very simple and fast due to quick and easy access to the replacement parts.

Other advantages include the possibility to draw pure water via a tap on the storage tank, as

well as, connecting the system directly to an instrument or glass washer.

The unit can either be bench or wall mounted. A flexible dispenser enables the user to remotely dispense water wherever it is needed.

Pure water dispensing is made easy by simply activating the valve lever. A continuous flow of pure water is accomplished by simply placing the dispenser lever in an upright position.

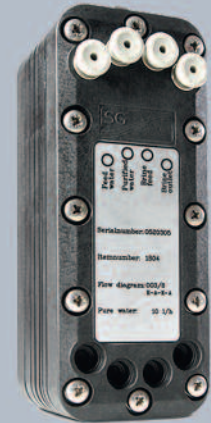
Our new systems are available with special features such as: volume control dispensing, a 24-hour-circulation mode with an extreme low noise level of <40 dba and an integrated RS232 interface for data recording. Variable length hoses for the remote dispenser are also available.

In all versions the polishing module MFIID is included. All UV versions are delivered with pretreatment module DTO and all other versions with the deionization module VMD.

CONSUMABLES		
Item	Change frequency	Catalog No.
Pretreatment Module AMB	6 – 12 monthly	2057
Deionization Module VMD	6 – 12 monthly	2050
Pretreatment Module DTO for applications that need low TOC	6 – 12 monthly	2094
Polishing Module MF III D for applications in the low TOC range	6 – 12 monthly	2051
Polishing Module ILT for inorganic applications	6 – 12 monthly	2092
Sterile filter 0.1 µm, 1000 cm ²	6 monthly	2052
Disinfection kit (pack of 3)	–	2055
UV- Replacement bulb, only for systems without TM	12 monthly	2068
UV- Replacement bulb, only for systems with TM	12 monthly	2069
RO Replacement Module	2 – 3 years	2083
CO ₂ Trap CT1, Replacement Cartridge	yearly	3502
UV-Submersible replacement bulb UV-SL 1	yearly	2595-1
UF Membrane Preventor 5000	18 – 36 monthly	2058
Consumable change frequency information is average and can vary.		



Pure Water Specifications for all types	
Product rate into the tank	10 l/h*
Conductivity	< 0.2 µS/cm
TOC	< 30 ppb
* 20 l/h upon request.	



Ultra Clear™ TWF system with El-Ion™ CEDI Cell

El-Ion™ CEDI (Continuous electrodeionization) cell

Pure and Ultrapure Water from a Single System – With Tap Water Feed

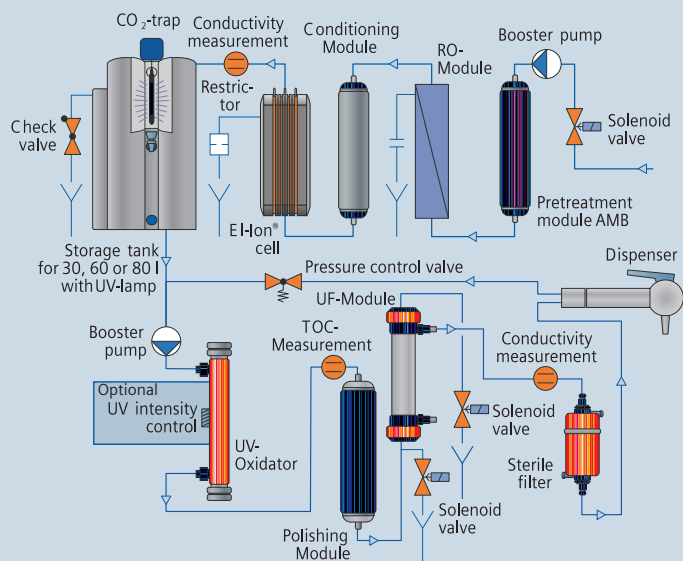
Ultrapure water production using the El-Ion™ CEDI cell

The Ultra Clear™ TWF system with El-Ion™ CEDI cell is equipped with the necessary components to produce pretreated and ultrapure water directly from a municipal tap water source.

The reverse osmosis unit has a recovery rate of > 30 % to conserve water. The continuous electro-deionization (CEDI) stage purifies RO product water down to a quality range between 0.06 to 0.2 µS/cm. CEDI product water can be drawn directly from the integrated storage tank.

A polishing cartridge is provided that can obtain a water quality of 0.055 µS/cm (18,2 MΩ-cm) with a TOC-level of < 1 ppb (only in units with UV oxidation). Systems with ultrafilters deliver ultrapure water that is RNase, DNase and DNA free with a dispense rate up to 1.8 LPM.

Ultra Clear™ TWF w/El-Ion™ Models		-	UV	plus	UV plus	UV TM	UV plus TM
Ultrapure water specifications							
Output up to	l/min	1.8	1.8	1.8	1.8	1.8	1.8
Conductivity at 25° C	µS/cm	0.055	0.055	0.055	0.055	0.055	0.055
Resistivity at 25° C	MΩ-cm	18.2	18.2	18.2	18.2	18.2	18.2
TOC	ppb	5 – 10	< 1	5 – 10	< 1	< 1	< 1
DNase, RNase, DNA		-	-	-	free	-	free
Bacteria	cfu/ml	< 1	< 1	< 1	< 1	< 1	< 1
Endotoxins	EU/ml	-	-	< 0.001	< 0.001	-	< 0.001
Particles > 0.1 µm	per ml	< 1	< 1	< 1	< 1	< 1	< 1
Feed water specification							
Feed water pressure	bar	0 – 5	0 – 5	0 – 5	0 – 5	0 – 5	0 – 5
Feed conductivity	µS/cm	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000
Colloid index SDI		< 3	< 3	< 3	< 3	< 3	< 3
Free Chlorine	mg/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fe	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Shipping weight 30 l / 60 l / 80 l	kg	41/44/56	42/45/57	42/45/57	44/47/59	43/46/58	44/47/59
Power supply	V/Hz	for all models 100 – 240 / 50 – 60					
Dimensions: H/W/D	mm	30 l tank: 535 / 560 / 320 60 l tank: 535 / 900 / 320 80 l tank: 1345 / 340 / 510					
Catalog Number for 30 l tank systems		2001-E	2002-E	2003-E	2004-E	2002-TM-E	2004-TM-E
Catalog Number for 60 l tank systems		2001-E/60	2002-E/60	2003-E/60	2004-E/60	2002-TM-E/60	2004-TM-E/60
Catalog Number for 80 l tank systems		2001-E/80	2002-E/80	2003-E/80	2004-E/80	2002-TM-E/80	2004-TM-E/80



Flowsheet of Ultra Clear™ TWF UV plus TM system with El-Ion™ CEDI Cell

Ancillary items for the Ultra Clear™ System

Item	Catalog No.
Bracket ET 30 for 30 l tank including screws and plugs	3317
Bracket ET 60 for 60 l tank including screws and plugs	3318
Dispenser hose extension on request (to be ordered together with the system, please specify the needed length)	02194-2
Extra 80 l tank booster pump for washing machine feed (to be ordered together with the system) With 5" 0.2 µm filter Without filter	3356-1 3356-2

The system water quality exceeds all reagent grade water quality standards including: ASTM Type 1, CLSI and ISO 3696 Type 1.

Various system options are available to fulfill all your lab needs. These options include an ultrafiltration module, UV-oxidization and TOC monitoring that can be tailored for any laboratory application in a single system. A built-in automatic flush cycle extends the life of the ultrafilter and helps reduce operating cost.

This compact system has been designed with all the required technical features to economically produce purified and ultrapure water. Performance of the system equals that of larger multi-

component purification systems that cost more to purchase and operate. The system does it all from one compact unit.

The unit can either be bench or wall mounted. A flexible remote dispenser enables the user to dispense water wherever it is needed.

Our new systems are available with special features such as: volume control dispensing, UV- intensity measurement (optional) with TOC monitoring. A programmable, 24-hour-circulation mode, an extreme low sound level (<40 dba) and integrated RS232 interface for data recording are included. Various remote dispenser hose lengths are also available.

CONSUMABLES

Item	Change frequency	Catalog No.
Pretreatment Module AMB	6 – 12 monthly	2057
Conditioning Module	Depends on inlet water hardness and used amount of water	2062
Polishing Module MF III D for applications in the low TOC range	6 – 12 monthly	2051
Polishing Module ILT for inorganic applications	6 – 12 monthly	2092
Sterile filter 0.1 µm, 1000 cm ²	6 monthly	2052
Disinfection kit (pack of 3)	–	2055
UV- Replacement bulb, only for systems without TM only for systems with TM	12 monthly 12 monthly	2068 2069
RO Replacement Module	2 – 3 years	2083
CO ₂ Trap CT1, Replacement Cartridge	yearly	3502
UV-Submersible replacement bulb UV-SL 1	yearly	2595-1
UF Membrane Preventor 5000	18 – 36 monthly	2058
El-Ion™ CEDI cell 10 l/h	4 – 5 years	1803
Consumable change frequency information is average and can vary.		

System Components



Pre-purification modules AMB and VMD, Polishing module MFIID and conditioning module for Ultra Clear™ system series. Purification modules for LaboStar™ systems.

Only new, specially selected and certified materials are used for the treatment steps in our ultrapure water systems.

High quality, virgin electronic grade ion exchange resins are used in cartridges and systems. Resins and treatment media go through a rigorous R&D stage before approval for use to ensure high quality and zero leachable material that could interfere with water quality. Upon delivery, each resin must pass incoming quality control inspection tests. Materials are strictly stored and handled according to our standard operating procedure to prevent contamination.

Carefully selected activated carbon is used in the systems to produce pure water with extremely low organic contaminants. However, different types are available depending on the required water quality or application.

All activated carbon materials undergo a complete cleaning process prior application to remove particles and impurities. This involves an acid wash followed by rinsing the carbon with ultrapure water. All wetted parts within the systems are specially selected and tested to ensure purity. Tests are performed to determine there are no extractable metals or TOC released from the water contact parts.

	Component	Catalog No.
	Pre-purification module AMB Activated carbon / pre-filter combination to protect RO membranes. Granulated carbon and a 1 µm filter.	2057
	Conditioning module Module used for the removal of residual hardness. The special deionizer resin prevents "Scaling" in the El-Ion™ cell.	2062
	Deionization module VMD Mixed bed resin module utilized for a reduction of the inlet conductivity. Used for inorganic applications.	2050
	Deionization module (LaboStar™ Systems) Mixed bed resin module utilized for a reduction of the inlet conductivity. Used for inorganic applications.	2160
	Pre-purification module DTO Application for low TOC-level with deionized feed water. Comprised of activated carbon and specially selected mixed bed resin.	2094
	Pre-purification module TAO Application for low TOC-level with tap water feed. Comprised of special pretreatment and high quality mixed bed resin.	2091
	Pre-treatment module (LaboStar™ Systems) Activated carbon / pre-filter and RO membrane combination.	2111
	Polishing module MFIID Special carbon and electronic grade resin material combined in one polishing module. Module used to remove organic contaminants (especially low TOC-level) and produce water at 0.055 µS/cm.	2051
	Polishing module ILT For inorganic application. Consist of electronics grade mixed bed resin material.	2092













High grade materials are vital for high quality water. From left to right: Activated carbon, anions, mixed bed and cation exchange resins.

The purification modules are accurately designed to ensure complete wetting of the activated carbon to remove entrained air and purge the systems.

Mixed bed resin modules must have the correct moisture content and fill level to ensure quality and operating capacity. Rapid filling of the modules is essential to prevent excess air contact and avoid the uptake of carbon dioxide.

An environment free of organic contaminants during the cartridge filling process plays a vital role in producing ultrapure water. Modules are sealed with airtight end caps to prevent drying and are shrink-wrapped to prevent contamination.

Modules should be stored in a cool, dry location (< 20 °C) away from light.

	Component	Catalog No.
	Polishing module HP1 / HP2 (LaboStar™ Systems)	
	HP1: For inorganic application. Consist of electronics grade mixed bed resin material	2172
	HP2: Selected carbon and electronic grade resin material combined in one polishing module. Module used to remove organic contaminants (especially low TOC-level) and produce water at 0.055 µS/cm	2173
	El-Ion™ CEDI cell Electro-deionization process module for pure water production < 0.2 µS/cm.	
	Reverse-Osmosis module High performance TFC (thin-film-composite) membrane with a salt retention rate of up to 98 %. Retention rate for dissolved organic compounds, particles and colloids and bacteria can exceed 99%.	2083
	UV-oxidization chamber UV light energy at 185 nm creates ozone. The 254 nm wavelengths energy reacts with the ozone and produces hydroxyl radicals (OH). These radicals oxidize the organic material in the water to carbon dioxide, water and some by-products like hydrogen peroxide. These by-products are then removed by the activated carbon material and electronics grade mixed bed resin.	
	UV-lamp	
	UV-lamp no. 2068 is utilized in systems without TM-measurement. UV-lamp no. 2069 is utilized in systems with TM-measurement	2068 2069
	Ultrafiltration module Ultrafiltration module „Preventor 5000“. Consists of hollow fiber membranes that produce water quality having an endotoxin-level of < 0.001 EU/ml, furthermore RNase-, DNase- and DNA-free.	2058
	Sterile filter 0.1 µm Filter with 0.1 µm pore size and 1000 cm ² surface area. The cartridge filter operates inline to eliminate dead volume and prevent bacterial contamination. Filter provides low back pressure and long service life.	2052
	Sterile filter 0.2 µm Filter with 0.2 µm pore size (pack of 3).	2064-3
	Sterile filter 0.2 µm Charged filter with 0.2 µm pore size, enables endotoxin retention (pack of 3).	2097
	Disinfection-kit Highly effective disinfection solvent (pack of 3).	2055



Easy handling of the disinfection kit



Disinfection kit

Ultrapure Water, Basic Information

Disinfection

An aqueous solution consisting of a mixture of bactericide and fungicide is used to disinfect systems.

The solvent has an extremely high biocide effect on all microbes found in water such as, bacteria, fungus (yeast) and algae. Material also provides the advantage of decomposing bio-film. The concentration used is classified as non-toxic, non-corrosive and not harmful to the skin.

Conversion Table Resistivity / Conductivity and TDS (Total Dissolved Substances)		
Resistivity (MΩ - cm)	Conductivity (μS/cm)	TDS in (ppm) CaCO ₃
18.18	0.0550	0.000
18.00	0.0556	0.000
17.00	0.0588	0.001
16.00	0.0625	0.003
15.00	0.0667	0.005
14.00	0.0714	0.006
13.00	0.0769	0.009
12.00	0.0833	0.011
11.00	0.0909	0.014
10.00	0.100	0.017
9.00	0.111	0.022
8.00	0.125	0.027
7.00	0.143	0.034
6.00	0.167	0.043
5.00	0.20	0.056
4.00	0.25	0.076
3.00	0.33	0.108
2.00	0.50	0.173
1.00	1.0	0.367
0.50	2.0	0.756
0.20	5.0	1.921
0.10	10.0	3.863
0.05	20.0	7.748
0.02	50.0	19.401
0.01	100.0	38.824

Understanding TOC

The Total Organic Carbon (TOC) content in water is expressed as the sum of the carbon (associated with organic material) contained in the water or wastewater analysis. The organic content of the water is based on the sum of all organic compounds present and only provides a generic measure of total carbon. Specific compounds are not identified. The TOC is measured in ppb (parts per billion).

The method efficiently destroys organic compounds in water using an ultraviolet chamber and lamp capable of producing radiation at 185 and 254 nm wavelengths. The by-product of CO₂ alters the conductivity of the water. The conductivity shift between inlet and outlet of the oxidization chamber is used to measure the TOC-level of the water.

Our ultrapure water systems with the TOC monitoring capability can also be equipped with a UV-intensity control mechanism (optional). The user can obtain a quick indication of the performance of the UV-lamp on the system display.



Photo: Fa. Knauer, Berlin

High-grade ultrapure water serves also as a protection for valuable HPLC-columns

ISO 3696 Water Specifications			
	Type I	Type II	Type III
Resistivity (megohm-cm compensated to 25°C)	10.0	1.0	0.25
TOC (ppb)	N.A.	80	400
Absorbance at 254 nm cm optical path (A.U.)	<0.001	<0.01	N.S.
Silica (mg/l)	<0.01	<0.02	<1
Dry residue after evaporating on heating at 110°C	N.A.	<1.0	<2.0

Type I, II and III water specifications

Water Quality Standards: Pure and Ultrapure Water

- The storage of ultrapure water without a recirculation loop should be avoided to minimize excess contamination caused by material leaching and bacterial growth.
- High quality pure and ultrapure water can only be maintained if the produced water is constantly being re-circulated via different purification stages including the sterile filter.
- A tank for storing pure water should always be equipped with a sterile vent filter, activated carbon unit, a CO₂ trap and a submersible UV-lamp. A constant high water quality level can only be maintained by implementation of these components.
- A regular disinfection procedure diminishes the formation of bio-film. Disinfection should be done on a regular basis.
- To prevent the growth of algae, tanks used for storing water should be made of opaque material or be placed in a cabinet to prevent exposure to light. Avoid direct sun light.
- The recommended materials of construction to prevent leaching are: polyethylene (PE), polypropylene (PP) and polyvinylidene fluoride (PVDF; Teflon). When using stainless 1.4401 (304L, 316L) grade or higher should be used.
- Purifying modules should be replaced on a regular basis in order to maintain high quality water and to minimize possible contamination of bacteria.
- Non recirculation periods or dead zones or dead-legs should always be avoided in all pure water systems. However, if non - recirculation periods occurs, the first 0.3 to 3 litres of water after an initial start should be discharged. This precaution is especially vital for critical applications such as the HPLC or ICP/ms.
- In order to guarantee the best water quality and operation of the water systems, the system should undergo a regularly scheduled preventative maintenance and service procedure. An agreement for this service can be arranged.
- Drainage tubing from any water treatment device should contain an air gap to prevent contamination. Maintain at least a 5-cm gap between the end of the tube and the drain.

ASTM Standard Specification for Reagent Water								
Type	µS/cm (max.)	MΩ-cm (min.)	TOC µg/l (max.)	Na µg/l (max.)	Cl µg/l (max.)	Total Silica µg/l (max.)	Bac. growth cfu/ml (max.)	Endotoxin EU/ml (max.)
I	0.055	18	50	1	1	3		
IA	0.055	18	50	1	1	3	10 / 1000	0.03
IB	0.055	18	50	1	1	3	10 / 100	0.25
IC	0.055	18	50	1	1	3	10 / 10	0.25

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