

Fields of use

Molecular biology
Microbiology
Electronics
Optics
Semiconductor
Biochemistry
Pharmaceuticals
Chemistry
Analytical methods

Ultrapure water

Pure water

Series LaboStar and Ultra Clear

Technology at its highest level



Always one step ahead.



All LaboStar DI types

General analysis, standard buffer, AAS, GC, IC, ICP, cell and tissue culture, pyrogen sensitive applications

All LaboStar UV types

Micro- und molecularbiology, PCR, HPLC, TOC analysis

Ultrapure water systems LaboStar

Highest water quality – economically produced.
Ready to go – for all needs

The extremely compact ultrapure water system is a cost-effective means of producing analytical grade water, and can be used on a laboratory bench or mounted to the wall. The water produced by the 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. Water produced by the UV version has a TOC value of 1 – 5 ppb. This water quality exceeds all relevant standards including ASTM Type I, NCCLS Type I and ISO 3696 Type I. The LaboStar 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-DI's polisher module 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.

A 0.2 μm charged sterile filter at the dispenser removes endotoxins. This



LaboStar on a laboratory bench.



LaboStar wall mounted.

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



2 * Gravity feed 1.2 l/min

makes it possible to produce pure water with an endotoxin content of <math><0.001</math> EU/ml without the need for any further investment in an ultrafilter.

The LaboStar advantages in brief:

- Ultra pure 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 are the mobile bench devices with an integrated tank

which can be directly filled with feed water.

The following advantages especially for type 3 and 4

- 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.

The LaboStar units are delivered with the first set of modules and filters and are ready for use.

Options

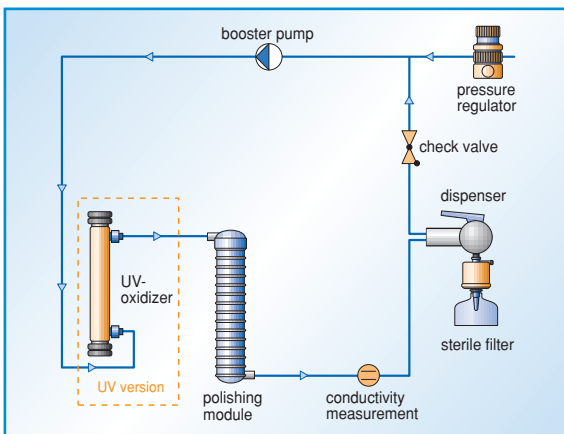
| Item | Cat. No. |
|---|-------------|
| Wall bracket (only for Labostar 3 + 4) | 2190 |

Consumables

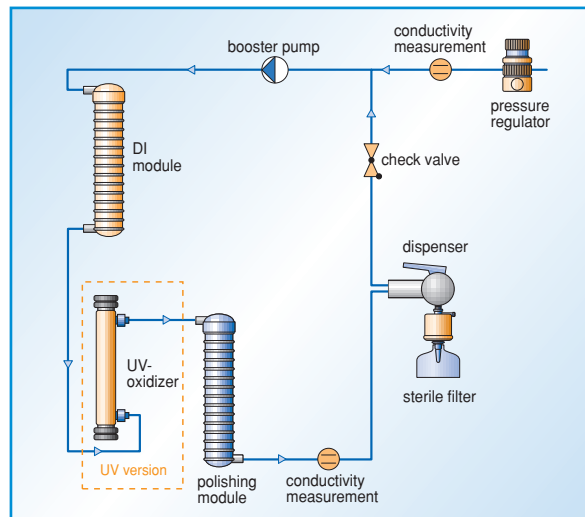
| Item | Change frequency | Cat. No. |
|-------------------------------------|------------------|-------------|
| DI-Modul* | 6 – 12 monthly | 2160 |
| UV replacement bulb** | 6 monthly | 2068 |
| Polishing module | | |
| – HP1 for low inorganic application | 6 – 12 monthly | 2172 |
| – HP2 for low organic application | 6 – 12 monthly | 2173 |
| Sterile filter (pack of 3) | 6 monthly | 2097 |
| Disinfection kit (pack of 3) | – | 2055 |

All change frequency informations are to be understood as average and can vary. * for LaboStar 2 DI and 4 DI / ** for UV versions

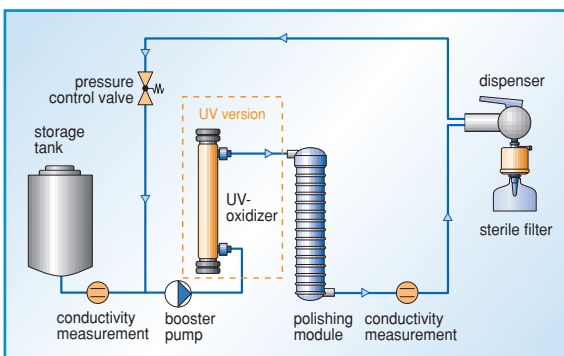
Flowsheet LaboStar 1-DI/UV



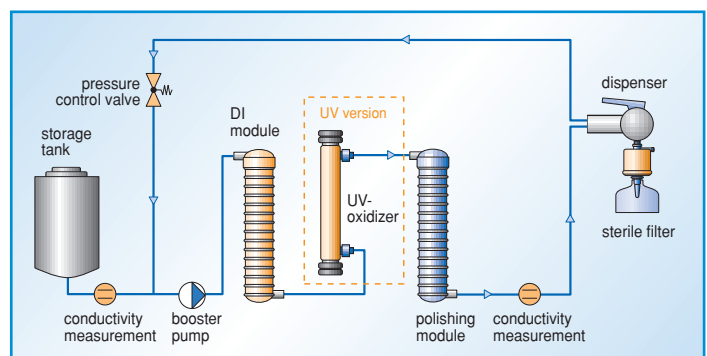
Flowsheet LaboStar 2-DI/UV



Flowsheet LaboStar 3-DI/UV



Flowsheet LaboStar 4-DI/UV



TOC: < 1 ppb

Typical applications

Ultra Clear / Integra:
AAS, routine analysis, standard buffer, GC

Ultra Clear / Integra UV and UV TM:
HPLC, IC, GC, GC/MS, TOC analysis, ICP and ICP/MS

Ultra Clear / Integra plus:
Cell and tissue culture, monoclonal antibody production, IVF, pyrogen sensitive applications

Ultra Clear /Integra UV plus and UV plus TM:
DNA sequencing, RNase- and DNase-free, DNA-free, PCR, IVF, 2-D-electrophoresis, critical cell and tissue culture, pyrogen sensitive applications

Pure purity

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

Outstanding performance: The Ultra Clear bench top system and the Ultra Clear Integra for space saving under-bench installation.

Each Ultra Clear series is equipped with economical state-of-the-art purification technology.

System include: A deionization module, conductivity meter to measure pretreated water, a polishing module and a 0.1 µm sterile filter in the recirculation loop.

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

All systems that include UV-oxidation, TOC monitoring and ultrafil-

tration to produce the highest possible water quality and guarantees the perfect water quality control. These units deliver RNase-, DNase- and DNA-free water.



The Integra – a space-saving alternative

For under-bench mounting of the system. A remotable dispense/display station can be mounted to the wall.

| Type* Ultra Clear ... | | - | UV | plus | UV plus | UV TM | UV plus TM |
|---------------------------------------|---------------|-----------------------------------|---------|---------|---------|---------|------------|
| Ultrapure water specifications | | | | | | | |
| Output** up to | <i>l/min</i> | 2 | 2 | 2 | 2 | 2 | 2 |
| Conductivity at 25° C | <i>µS/cm</i> | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 |
| Resistivity at 25° C | <i>MΩ-cm</i> | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| TOC | <i>ppb</i> | 5 – 10 | < 1 | 5 – 10 | < 1 | < 1 | < 1 |
| DNase, RNase, DNA | | - | - | - | free | - | free |
| Bacteria | <i>cfu/ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Endotoxins | <i>EU/ml</i> | - | - | < 0.001 | < 0.001 | - | < 0.001 |
| Particles > 0.1 µm | <i>per ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Feed water specification | | | | | | | |
| Feed water pressure | <i>bar</i> | 0.1 – 5 | 0.1 – 5 | 0.1 – 5 | 0.1 – 5 | 0.1 – 5 | 0.1 – 5 |
| Feed conductivity | <i>µS/cm</i> | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| TOC | <i>ppb</i> | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| Shipping weight <i>Clear/Integra</i> | <i>kg</i> | 24 / 26 | 25 / 27 | 25 / 27 | 26 / 28 | 26 / 28 | 26 / 28 |
| Power supply | <i>V/Hz</i> | for all types 100 – 240 / 50 – 60 | | | | | |
| Dimensions: H/W/D | <i>mm</i> | for all types 530 / 340 / 320 | | | | | |
| Catalogue Number Ultra Clear | | 2001 | 2002 | 2003 | 2004 | 2002-TM | 2004-TM |
| Catalogue Number Integra | | 2005 | 2006 | 2007 | 2008 | 2006-TM | 2008-TM |

* The technical specifications are the same for all Integra systems (only the Integra housing dimensions are slightly smaller).
** Gravity feed 1.5 l/min

Systems are also capable of producing purified water with bacterial 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. Mount the system wherever space is a premium. If there is a need for a space saving under bench installation the Ultra Clear Integra is the right choice.

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

SG utilizes a single UV-lamp 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. 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.

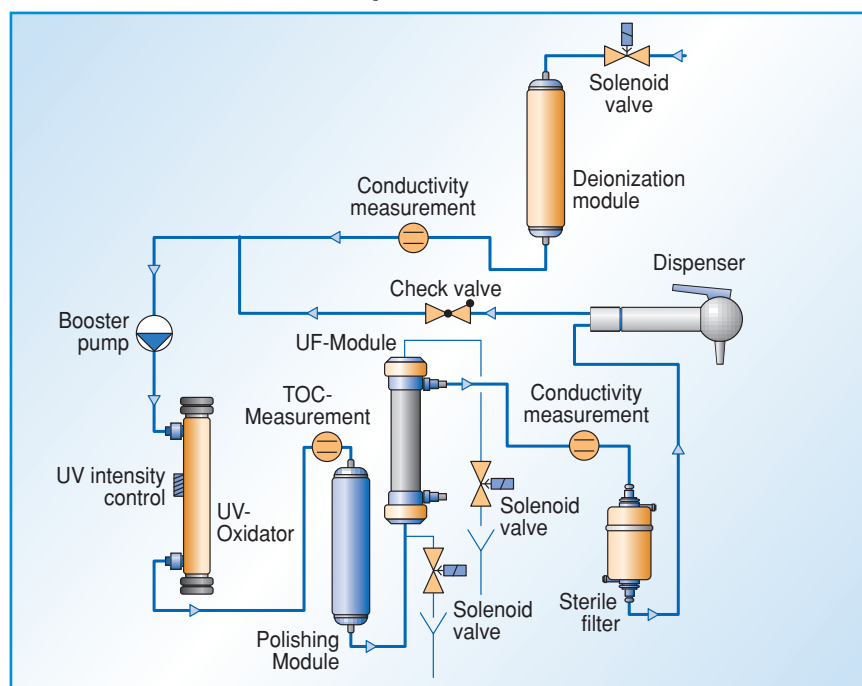
Pure water dispensing is made easy by simply activating the valve lever. A continuous flow of pure water is achieved by simply placing the draw-off lever in an upright position.

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.

Options

| Item | Cat. No. |
|--------------------------|----------------|
| Dispenser hose extension | 02194-2 |

Flowsheet Ultra Clear UV plus TM



Consumables

| Item | Change frequency | Cat. 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 | 6 monthly | 2068 |
| UV- Replacement bulb, only for systems with TM | 6 monthly | 2069 |
| UF Membrane Preventor 5000 | 18 – 36 monthly | 2058 |

All change frequency informations are to be understood as average and can vary.



The dispensing of ultrapure water can be so easy!

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

LaboStar 3/7 TWF-DI

General analysis, standard buffer, AAS, GC, IC, ICP, cell and tissue culture, pyrogen sensitive applications, type III water

LaboStar 3/7 TWF-UV

Micro- und molecularbiology, PCR, HPLC, TOC analysis, type III water

Ultrapure water systems

LaboStar 3/7 TWF-DI and -UV

From tap to ultrapure water – only one innovative step

The LaboStar 3/7-TWF-DI and UV produces 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, NCCLS Type I and ISO 3696 Type I.



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

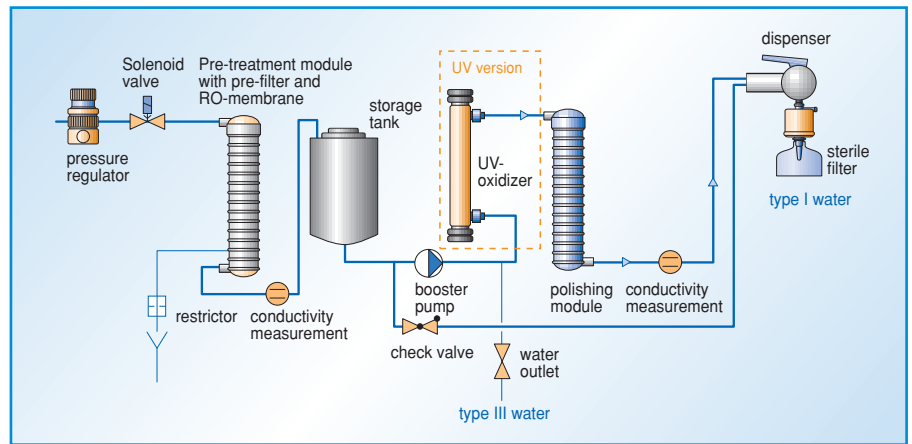
A conductivity sensor constantly measures the purity of the product water in the recirculation loop. A charged 0.2 µm sterile filter at the dispenser removes endotoxins, eliminating the need for an ultrafilter.

The advantages in brief:

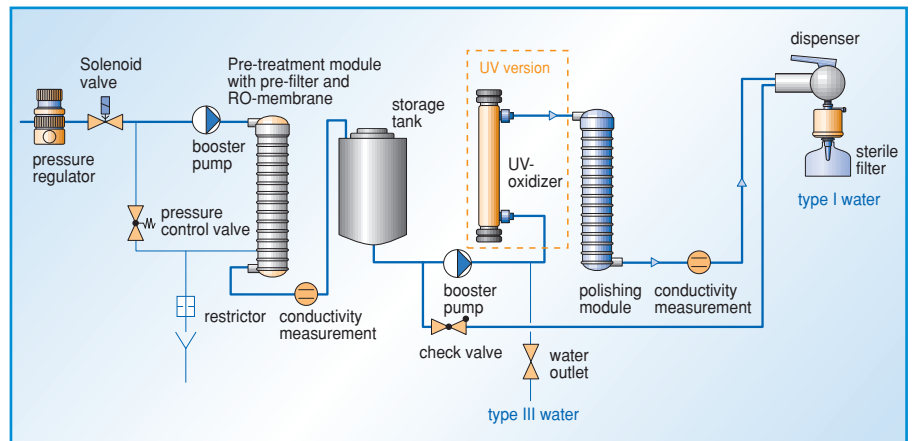
- Connection to municipal drinking water supply
- 7 liter tank volume
- Ultrapure water circulation right into the dispenser head
- Easy to dispense water using the practical dispenser
- Whisper mode
- Rapid and simple disinfection
- Conductivity monitoring of pre-treatment module and ultrapure water
- 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.

Flowsheet LaboStar 3 TWF-DI/UV



Flowsheet LaboStar 7 TWF-DI/UV



Consumables

| Item | Change frequency | Cat. No. |
|-------------------------------------|------------------|----------|
| Pre-treatment/RO module 3 / 7 l/h | 6 – 12 monthly | 2111 |
| UV replacement bulb* | 6 monthly | 2068 |
| Polishing module | | |
| – HP1 for low inorganic application | 6 – 12 monthly | 2172 |
| – HP2 for low organic application | 6 – 12 monthly | 2173 |
| Sterile filter (pack of 3) | 6 monthly | 2097 |
| Disinfection kit (pack of 3) | – | 2055 |

All change frequency informations are to be understood as average and can vary.
* for UV versions

Options

| Item | Cat. No. |
|--|----------|
| Wall bracket | 2190 |
| Vent filter, PTFE membrane (pack of 3) | 3513 |



Sterile filter, 0.2 µm, with retention of endotoxin.

Ultra Clear TWF:
AAS, routine analysis, standard buffer, GC

Ultra Clear TWF UV and UV TM:
HPLC, IC, GC, GC/MS, TOC analysis, ICP and ICP/MS

Ultra Clear TWF plus:
Cell and tissue culture, monoclonal antibody production, IVF, pyrogen sensitive applications

Ultra Clear TWF UV plus and UV plus TM:
DNA sequencing, RNase- and DNase-free, DNA-free, PCR, IVF, 2-D-electrophoresis, critical cell and tissue culture, pyrogen sensitive applications

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 ultrapure TWF system has a dispense rate of up to 1.8 LPM with a

water quality of 18.2 MΩ-cm and a TOC-level of < 1 ppb!

The system exceeds all reagent grade water quality standards including; ASTM Type 1, NCCLS Type 1 and ISO Type 1.

TWF models are available to fulfil all of your ultrapure water needs. Options



include: ultrafiltration, UV-oxidation and TOC monitoring with intensity measurement for any application.

Pretreatment, reverse osmosis module, deionization cartridge, storage tank, UV-oxidation chamber, polisher, ultrafilter and sterile filter are all integrated into one system. The system delivers

| Feed water specification | all types |
|--------------------------|--------------|
| Feed water pressure | 0 – 5 bar |
| Feed conductivity | < 2000 µS/cm |
| Colloid index SDI | < 3 |
| Free Chlorine | < 0.5 mg/l |
| Fe | < 0.1 mg/l |

| Pure water specification | all types |
|----------------------------|-------------|
| Product rate into the tank | 10 l/h* |
| Conductivity | < 2 µS/cm** |

* 20 l/h upon request.

** Limiting value adjustable.

| Type Ultra Clear TWF... | | – | UV | plus | UV plus | UV TM | UV plus TM |
|---------------------------------------|---------------|---|-----------|-----------|-----------|--------------|--------------|
| Ultrapure water specifications | | | | | | | |
| Output up to | <i>l/min</i> | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Conductivity at 25° C | <i>µS/cm</i> | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 |
| Resistivity at 25° C | <i>MΩ-cm</i> | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| TOC | <i>ppb</i> | 5 – 10 | < 1 | 5 – 10 | < 1 | < 1 | < 1 |
| DNase, RNase, DNA | | – | – | – | free | – | free |
| Bacteria | <i>cfu/ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Endotoxins | <i>EU/ml</i> | – | – | < 0.001 | < 0.001 | – | < 0.001 |
| Particles > 0.1 µm | <i>per ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Shipping weight 30 l/60 l/80 l | <i>kg</i> | 41/44/56 | 42/45/57 | 42/45/57 | 44/47/57 | 43/46/58 | 44/47/59 |
| Power supply | <i>V/Hz</i> | for all types 100 – 240 / 50 – 60 | | | | | |
| Dimensions: H/W/D | <i>mm</i> | 30 l tank: 530 / 560 / 320 – 60 l tank: 530 / 900 / 320 – 80 l tank: 1340 / 340 / 510 | | | | | |
| Catalogue Number with 30 l tank | | 2001-D | 2002-D | 2003-D | 2004-D | 2002-TM-D | 2004-TM-D |
| Catalogue Number with 60 l tank | | 2001-D/60 | 2002-D/60 | 2003-D/60 | 2004-D/60 | 2002-TM-D/60 | 2004-TM-D/60 |
| Catalogue Number with 80 l tank | | 2001-D/80 | 2002-D/80 | 2003-D/80 | 2004-D/80 | 2002-TM-D/80 | 2004-TM-D/80 |

ultrapure water which is RNase-, DNase- and DNA-free. Endotoxin content is extremely low at <0.001 EU/ml.

SG has successfully created this compact system with all the required technical features to economically produce purified and ultrapure water. Other systems consisting of separate reverse osmosis unit, storage tank and polishing unit are typically expensive. We have proudly accomplished our goal of developing water purification systems with low running costs.

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.

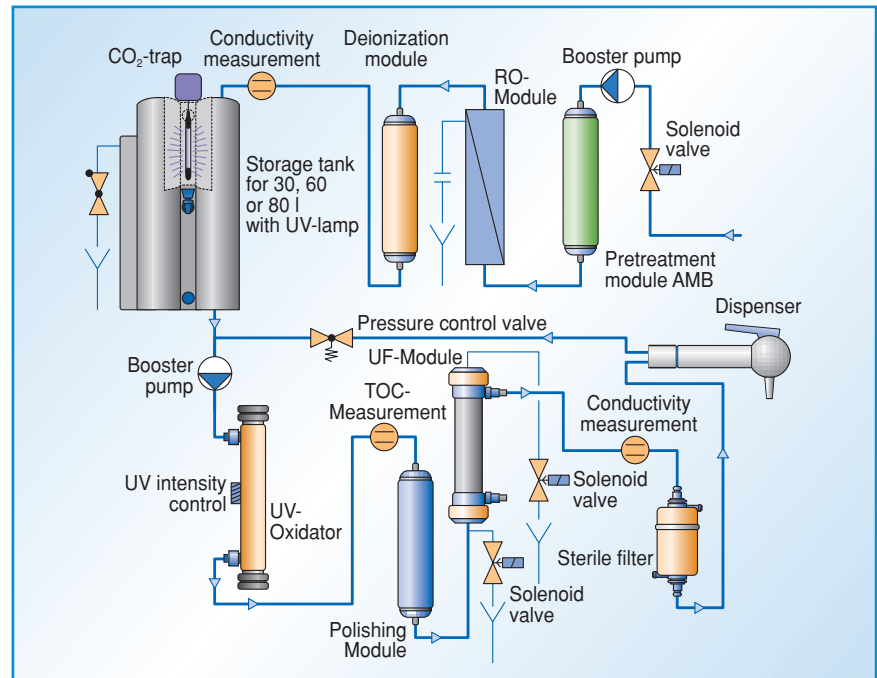
Our new systems are available with special features such as: volume control dispensing, a „24-hour-circulation“ mode with an extreme low noise level of <40 dba and an integrated RS 232 interface for data recording. Variable length hoses for the remote dispenser are also available.

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.

Flowsheet Ultra Clear TWF UV plus TM



Options

| Item | Cat. 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 | 02194-2 |
| Extra 80 l tank booster pump for washing machine feed (to be ordered together with the system) | 3358-1 |

Consumables

| Item | Change frequency | Cat. 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 | 6 monthly | 2068 |
| UV- Replacement bulb, only for systems with TM | 6 monthly | 2069 |
| RO-Membrane | 2 – 3 years | 03303 |
| CO ₂ Trap CT1, Replacement Cartridge | yearly | 3502 |
| UV-Submersible replacement bulb UV-SL 1 | yearly | 2593-1 |
| UF Membrane Preventor 5000 | 18 – 36 monthly | 2058 |

All change frequency informations are to be understood as average and can vary.

All types:

General chemistry, laboratory washing machines, water for autoclaves and environmental chambers

Ultra Clear TWF / El-Ion®:

AAS, routine analysis, standard buffer, GC

Ultra Clear TWF UV and UV TM / El-Ion®:

HPLC, IC, GC, GC/MS, TOC analysis, ICP and ICP/MS

Ultra Clear TWF plus / El-Ion®:

Cell and tissue culture, monoclonal antibody production, IVF, pyrogen sensitive applications

Ultra Clear TWF UV plus and UV plus TM / El-Ion®:

DNA sequencing, RNase- and DNase-free, DNA-free, PCR, IVF, 2-D-electrophoresis, critical cell and tissue culture, pyrogen sensitive applications

Pure and ultrapure water from a single system – with tap water feed.

Ultrapure water production utilizing the El-Ion® technology

Simultaneous production of purified and ultrapure water:
The Ultra Clear TWF/El-Ion® system 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 electro-deionization (EDI) stage purifies RO product water down to a quality range between 0.06 to 0.2 µS/cm. EDI 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. The system delivers ultrapure water that is RNase-, DNase- and DNA-



| Feed water specification | all types |
|--------------------------|--------------|
| Feed water pressure | 0 – 5 bar |
| Feed conductivity | < 2000 µS/cm |
| Colloid index SDI | < 3 |
| Free Chlorine | < 0.5 mg/l |
| Fe | < 0.1 mg/l |

| Pure water specification | all types |
|--------------------------|-------------|
| Production rate to tank | 10 l/h* |
| Conductivity | < 0.2 µS/cm |
| TOC | < 30 ppb |

* 20 l/h upon request.



| Type Ultra Clear TWF / El-Ion®... | – | UV | plus | UV plus | UV TM | UV plus TM | |
|---------------------------------------|---------------|---|-----------|-----------|-----------|--------------|--------------|
| Ultrapure water specifications | | | | | | | |
| Output up to | <i>l/min</i> | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | |
| Conductivity at 25° C | <i>µS/cm</i> | 0.055 | 0.055 | 0.055 | 0.055 | 0.055 | |
| Resistivity at 25° C | <i>MΩ-cm</i> | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | |
| TOC | <i>ppb</i> | 5 – 10 | < 1 | 5 – 10 | < 1 | < 1 | |
| DNase, RNase, DNA | | – | – | free | – | free | |
| Bacteria | <i>cfu/ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | |
| Endotoxins | <i>EU/ml</i> | – | – | < 0.001 | – | < 0.001 | |
| Particles > 0.1 µm | <i>per ml</i> | < 1 | < 1 | < 1 | < 1 | < 1 | |
| Shipping weight 30 l/60 l/80 l | <i>kg</i> | 41/44/56 | 42/45/57 | 42/45/57 | 44/47/59 | 43/46/58 | |
| Power supply | <i>V/Hz</i> | for all types 100 – 240 / 50 – 60 | | | | | |
| Dimensions: H/W/D | <i>mm</i> | 30 l tank: 535 / 560 / 320 – 60 l tank: 535 / 900 / 320 – 80 l tank: 1345 / 340 / 510 | | | | | |
| Catalogue Number with 30 l tank | | 2001-E | 2002-E | 2003-E | 2004-E | 2002-TM-E | 2004-TM-E |
| Catalogue Number with 60 l tank | | 2001-E/60 | 2002-E/60 | 2003-E/60 | 2004-E/60 | 2002-TM-E/60 | 2004-TM-E/60 |
| Catalogue Number with 80 l tank | | 2001-E/80 | 2002-E/80 | 2003-E/80 | 2004-E/80 | 2002-TM-E/80 | 2004-TM-E/80 |

free with a dispense rate up to 1.8 LPM!

The system water quality exceeds all reagent grade water quality standards including; ASTM Type 1, NCCLS Type 1 and ISO Type 1.

Various system options are available to fulfil all your lab needs. These options include: ultrafiltration module, UV-oxidation 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.

SG has created this compact system with all the required technical features to economically produce purified and ultrapure water. Performance of the TWF/EI-Ion® system equals that of larger multi-component purification systems that cost more to buy and operate. The TWF/EI-Ion® does it all from one compact unit.

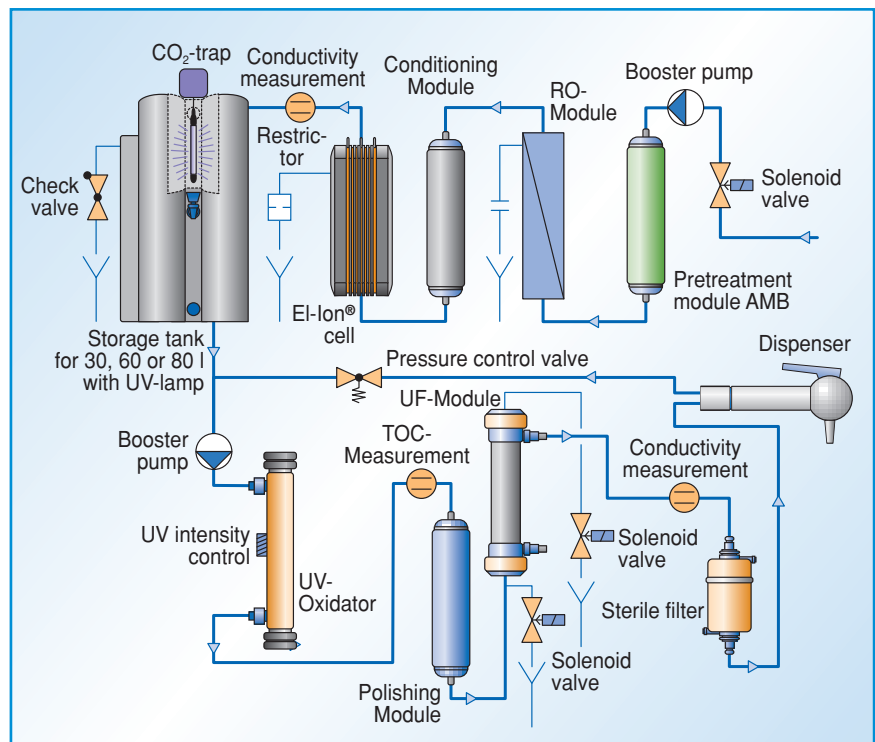
We have proudly accomplished our goal of developing new, compact and economical systems that produce two grades of reagent water.

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 with TOC monitoring. A programmable, „24-hour-circulation“ mode with extreme low sound level (< 40 dba) and integrated RS 232 interface for data recording are included. Various remote dispenser hose lengths are also available.

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

Flowsheet Ultra Clear TWF / EI-Ion® UV plus TM



Options

| Item | Cat. 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 | 02194-2 |
| Extra 80 l tank booster pump for washing machine feed (to be ordered together with the system) | 3358-1 |

Consumables

| Item | Change frequency | Cat. 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 | 6 monthly | 2068 |
| UV- Replacement bulb, only for systems with TM | 6 monthly | 2069 |
| RO-Membrane | 2 – 3 years | 03303 |
| CO ₂ Trap CT1, Replacement Cartridge | yearly | 3502 |
| UV-Submersible replacement bulb UV-SL 1 | yearly | 2593-1 |
| UF Membrane Preventor 5000 | 18 – 36 monthly | 2058 |
| EI-Ion®-cell 10 l/h | 4 – 5 years | 1803 |

All change frequency informations are to be understood as average and can vary.

System Components

Embedded components of the SG-units

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

High quality, virgin electronic grade ion exchange resins are used in SG water 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 SG 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 SG Water 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.

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



Pre-purification module AMB

Catalogue No.: 2057

Activated carbon / pre-filter combination to protect RO membranes. Granulated carbon and a 1 µm filter.



Conditioning module

Catalogue No.: 2062

Module used for the removal of residual hardness. The special deionizer resin prevents „Scaling“ in the El-Ion cell.



Deionization module VMD

Catalogue No.: 2050

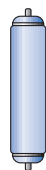
Mixed bed resin module utilized for a reduction of the inlet conductivity. Used for inorganic applications.



Deionization module (LaboStar)

Catalogue No.: 2160

Mixed bed resin module utilized for a reduction of the inlet conductivity. Used for inorganic applications.



Pre-purification module DTO

Catalogue No.: 2094

Application for low TOC-level with deionized feed water. Comprised of activated carbon and specially selected mixed bed resin.



Pre-treatment module (LaboStar)

Catalogue No.: 2111

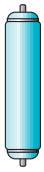
Activated carbon / pre-filter and RO membrane combination.



Polishing module MFIID

Catalogue No.: 2051

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.



Polishing module ILT

Catalogue No.: 2092

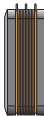
For inorganic application.
Consist of electronics grade mixed bed resin material.



Polishing module HP1 / HP2 (LaboStar)

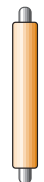
Catalogue No.: 2172/2173

HP1: For inorganic application.
Consist of electronics grade mixed bed resin material (Cat. No. 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 (Cat. No. 2173).



El-Ion® cell

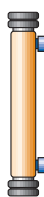
Electro-deionization process module for pure water production < 0.2 µS/cm.



Reverse-Osmosis module

Catalogue No.: 03303

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 %.



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

Catalogue No.: 2068 / 2069

UV-lamp no. 2068 is utilized in systems without TM-measurement.
UV-lamp no. 2069 is utilized in systems with TM-measurement



Ultrafiltration module

Catalogue No.: 2058

SG 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.



Sterile filter 0.1 µm

Catalogue No.: 2052

Filter with 0.1 µm pore size and 1000 cm² surface area. The cartridge filter operates inline to eliminate dead volume and prevent bacterial contamination. Filter provides low back pressure and long service life.



Sterile filter 0.2 µm

Catalogue No.: 2064-3

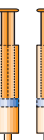
Filter with 0.2 µm pore size (pack of 3).



Sterile filter 0.2 µm

Catalogue No.: 2097

Charged filter with 0.2 µm pore size, enables endotoxin retention (pack of 3).



Disinfection-kit

Catalogue No.: 2055

Highly effective disinfection solvent, selected designed for SG-systems (pack of 3).

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.

The storage of modules is limited and items should be used within one year. Modules should be stored in a cool, dry location (< 20 °C) away from light.

Freshly produced replacement modules can always be obtained from SG.

Hint: It is best to rotate stock based on a first in first out method to ensure older stock is used first.



High grade materials are a vital aspect for highest quality. From left to right: Activated carbon, anions-, mixed bed- and cationexchange resins.



Pre-purification modules AMB and VMD, Polishing module MFIID and Conditioning module for Ultra Clear series.



Purification modules for the LaboStar series.

Ultrapure water, basic information

SG-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-films. The concentration used is classified as non-toxic, non-corrosive and not harmful to the skin.



SG disinfection kit.

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 |



Easy handling of the SG disinfection kit.

Info 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 waste water 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) and is determined automatically. 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 oxidation chamber is used to measure the TOC-level of the water. SG ultrapure water systems having the TOC monitoring capability are also equipped with a UV-intensity control mechanism. The user can obtain a quick indication of the performance of the UV-lamp in % via the system display.

Pure and ultrapure water

1. The storage of ultrapure water without a recirculation loop should be avoided in order to minimize excess contamination caused by material leaching and bacterial growth.
2. High quality pure and ultrapure water can only be maintained if the produced water is constantly being recirculated via different purification stages including the sterile filter.
3. 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.
4. A regular disinfection procedure diminishes the formation of Biofilms. The SG-disinfection should be done on a regular basis.
5. 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.
6. 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.
7. Purifying modules should be replaced on a regular basis in order to maintain high quality water and to minimize possible contamination of bacteria.
8. 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.
9. In order to guarantee best water quality and operation of the SG-Water systems, the systems should undergo a regularly scheduled preventative maintenance and service procedure. An agreement for this service can be arranged with SG Water.
10. 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.

Water Quality Standards

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 |



Photo: Fa. Knauer, Berlin

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

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 |

SG – worldwide

Our partners in:

Algeria · Argentina · Australia · Austria · Bahrain · Bangladesh
Belgium · Brazil · Bulgaria · Canada · Chile · China · Colombia
Croatia · Cyprus · Czech Republic · Denmark · Dominican
Republic · Ecuador · Egypt · England · Estonia · Finland · France
Ghana · Germany · Greece · Hong Kong · Hungary · Iceland
India · Indonesia · Iran · Iraq · Ireland · Italy · Japan · Jordan
Kazakhstan · Korea · Kosovo · Kuwait · Latvia · Lebanon · Libya
Lithuania · Luxembourg · Malaysia · Marocco · Mexico
Netherlands · Nigeria · Norway · Oman · Pakistan · Peru
Philippines · Poland · Portugal · Qatar · Romania · Saudi Arabia
Serbia · Singapore · Slovakia · Slovenia · Spain · Sri Lanka
South Africa · Sudan · Sweden · Switzerland · Syria · Taiwan
Thailand · Tunisia · Turkey · Ukraine · United Arab Emirates
USA · Venezuela · Vietnam · Yemen



A Siemens Business



Headquarter: SG Wasseraufbereitung und Regenerierstation GmbH

Fahrenberg 8 · 22885 Barsbüttel · Tel.: 040 / 6 70 868 6 · Fax: 040 / 6 70 868 44
e-mail: info@sgwater.de · Internet: www.sgwater.de

USA: Siemens Water Technologies

10 Technology Drive · Lowell MA 01851 · Phone: +1 978 934 9349 or 800 466 7873
e-mail: tech.support.water@siemens.com