Virex Pro 1000

Ultrafiltration Units

User Manual

English

For tips and tricks, support and sharing of your experiences visit

www.support.seccua.com

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1. User Information

1.1 General

The Virex Pro 1000 ultrafiltration installations simultaneously remove turbidity and pathogens from water supplied from surface, spring or well water sources: Cost-efficiently, without the use of chemicals or radiation.

The fully automated conditioners use extra-rugged, certified ultrafiltration membranes with pore sizes of 20 nanometers or less. 1,000 times smaller than those of a conventional microfilter, the pores in the membrane nearly completely remove viruses, bacteria and legionella from all types of impure water.

The fully automated, integrated membrane testing, in accordance with approved and proven testing methods, provide the highest possible levels of safety.

Important Note:

This unit is subject to Limited Warranty Conditions, as described in the chapter “Limited Warranty Conditions” in this manual. Do not operate the unit if you disagree with those Warranty Conditions.

1.2 Scope of services and accessories

According to the accessories installed, the system has the following additional performance characteristics:

Characteristic	Virex Pro	Virex Pro 1000 with Connectivity Kit	Virex Pro 1000 with GSM modem
Filtration, cleaning	√	√	√
Integrity test	√	√	√
Connection of GSM modem	√	√	√
Programming via USB	√	√	√
Programming via modem			√
Alarm display on the unit	√	√	√
Alarm signal via potential-free contact		√	
Alarm signal via SMS			√
Data logger readable via USB	√	√	√
Data logger readable via modem			√
Control of inlet pumps		√	
Control of dosing pumps (feed and/or backwash)		√	
Monitoring of peripheral equipment		√	

The Connectivity Kit and the modem can be combined.

1.3 Important information

Please read the guarantee conditions carefully. You can find these in the chapter "Limited Warranty " at the end of this user manual as well as in the general terms and conditions of the manufacturer. This system left our facilities complete and in functioning condition. Please check the unit immediately upon receipt for completeness and possible shipping damage.

If the system or parts of the system have been damaged during transport, notify the transport company immediately. Transport damage to the system is not covered by the guarantee.

The guarantee cannot be claimed in the event of damages of the system caused by:

- Transport,
- Improper use or incorrect installation;
- Non-expert and/or insufficient maintenance;

- Operation of the system outside the operating conditions described in this user manual; or
- Modifications to the system.

Important:

Please be sure that this user manual is always kept close to the system and is always accesible to the operator and that it is handed over in the event of a change in ownership.

1.4 Contact for service and technical support

Should you require help with your system, please contact your service partner or dealer directly.

Customer support:

Every effort has been made to assure the completeness and readability of these operating instructions. If you have any problems or questions, we would appreciate you letting us know so that we can improve this user manual.

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2. Important Safety Instructions

Warning:
In addition to the instructions contained in this manual, be sure to heed all other safety and accident-prevention instructions!

Follow these additional **directives for the safe operation** of the system:

- Read this user manual carefully before the first commissioning.
- All installations and/or changes must be carried out by qualified experts.
- Install the system exactly as described in the user manual.
- Only use the recommended chemicals for cleaning.
- Do not connect the system to the power mains if the connecting plug or cable is damaged.
- Only authorized service technicians should perform maintenance on this system. For any modifications or repairs, contact your service partner.
- Do not expose any electrical cables to water.
- Do not kink the connecting cable. Ensure that it is safely and sufficiently attached.
- When performing any repairs, disconnect the system, remove it from the network and let it cool down,
- Electrical protective measures in accordance with VDE 0100 must be checked by authorized experts.
- When mounting the hood make sure to connect the PE cable.
- Do not use any extension cords in the installation of the system.
- The maximum differential pressure (measuring points are in front of and behind the UF-filter / on the filter unit) may not exceed 2,5bar/36,26 psi
- Avoid pressure shocks. These can be caused e.g. by shutting off external valves or pumps in the inlet of the system.
- Be careful! Solenoid valves can become hot.

Warning:
When dealing with chemicals pay close attention to the relevant instructions and security warnings on the containers! Danger of chemical burns and poisoning! We urgently recommend that the system be installed by an authorized service partner. Please observe all the relevant regulations at the time of installation!

Warning:
Be extremely cautious when handling chemicals. Follow the manufacturer's instructions in every circumstance!

Never mix chemicals with other cleaning agents! Always use protective gloves and protective glasses while working with the chemicals!

All cleaning and disinfection chemicals must be NSF 60 certified

Warning:
Caution: electrical voltage!

The power supply to the system must be interrupted before carrying out work on the control unit or the relay box. Always disconnect the power supply before opening the covers of the control unit or the relay box!

3. Operating Conditions and System Layout

3.1 Operating data of the systems

Max. operating pressure	5.0 bar (=500 kPa, 73 psi)
Operating temperature	1°C to 40 °C (34 °F to 104 °F)
Water temperature	4°C to 40 °C (39 °F to 104 °F)
Storage temperature	0 °C to +40 °C (32°F to 104°F)
pH-range	1 to 13 (during cleaning) 2 to 11 (during operation)
Chlorine tolerance	In regard to free chlorine: Total loading 200,000 (mg/l)xh, 200 mg/l max. concentration
Pressure difference inlet – filtrate	0 – 2.5 bar (=250 kPa; 0 to 36.26 psi)
Separating limit (g/mol or Dalton)	100,000 – 150,000
Cleaning method	Cleaning and backwashing, either time-interval controlled, according to a particular time or through contamination monitoring
Max. permissible supply pressure	5.0 bar (= 500kPa; 72,52 psi)

Warning:

Never exceed the maximum operating pressure. Make sure that no water hammer occurs which might exceed the maximum operating pressure!

Note:

See further details on the performance of each respective system in the appendix.

3.2 System layout

1) General information about pressure shocks

Rapidly closing valves, piston pumps and vertical pipe layouts can cause damaging pressure shocks. These, in turn, can lead to fibrous fractures in the membrane, damage to the pipeline network, the membrane itself as well as the seals and additionally can cause deviations to system dimensions.

For all practical applications of ultrafiltration, liquids are not compressible, all energy is immediately transferred. This energy becomes dynamic, when force acts on it, such as rapidly-closing valves or non speed-regulated pumps.

Impacts and pressure shocks lead to sudden changes in flow speeds. Pressure shocks normally damage the system through rapid starting, stopping or changes in the direction of flow. Any of these causes can lead to catastrophic faults in the system. Rapidly closing valves, whether activated manually or automatically, are without question the most frequent cause of pressure shocks in the application. A valve closing in 1.5 seconds or less (depending upon the size of the valve and the system conditions), can cause an abrupt break in the flow. A pressure shock (audible wave) caused by a rapidly closing valve can easily amount to five times the normal system pressure. Therefore, the utilization of calculation programs, which enable comprehensive evaluation of the pressure and the flow characteristics of the system, are recommended for the pressure evaluation of the system that is to be installed in the facility. For evaluation, the analysis should be utilized for the "worst case scenario", the normal operation and furthermore for the pump circulation.

2) Filtration performance

The filtration performance of the system among other depends on the following parameters:

a) The utilized filter surface area of the system,

b) the flux rate, i.e. the flux rate (throughput per filter surface area)

System type	Membrane surface area	Long-time flux rate 80 – 160 l/(m²h)	Flux rate at peak load max. 300 l/(m²h)
Virex Pro 1000	16 m² (172 ft²)	1280–2560 l/h (290-581 gal/h)	4,8 m³/h (1090 gal/h)

3) Typical flux rate

The following table shows the applicable flow rate through the unit depending on the degree of contamination of the raw water. These values are guidelines and can differ upwards or downwards depending on the achievable contamination. In case of doubt it is recommended to refer to a reference application or if necessary to operate a pilot system.

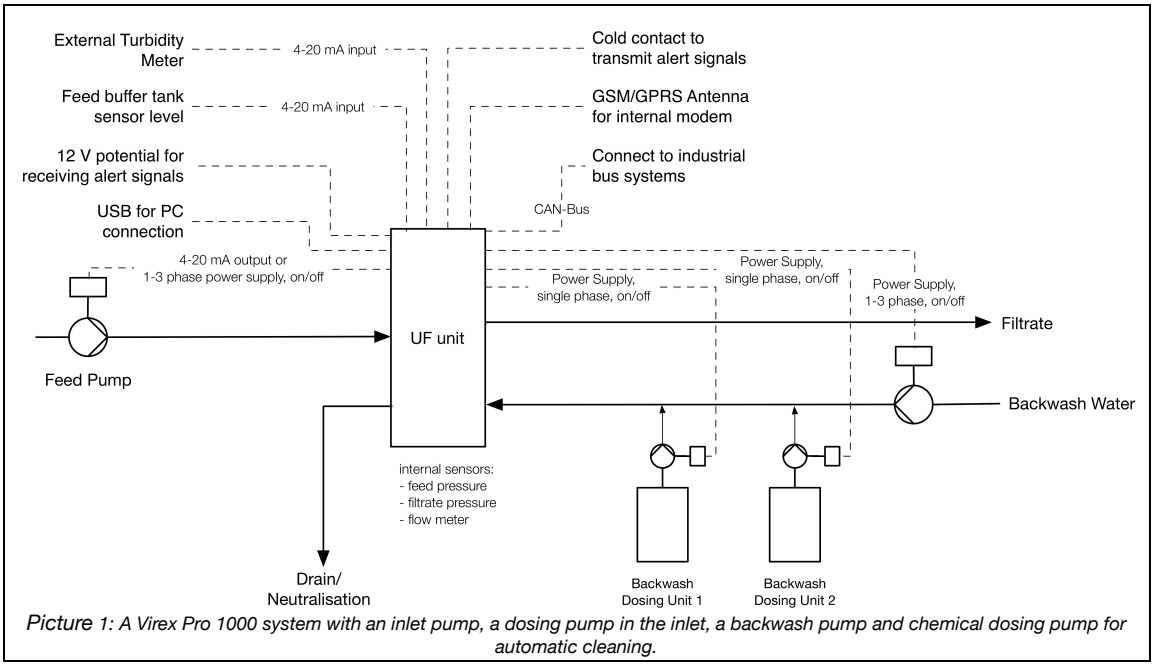
Raw water inlet	Properties	Recommended process	Flowrate, continuous
Well or spring water	Low degree of turbidity No DOC	<300 µm pre-filtration Ultrafiltration	1920 l/h (8.4 gpm)
Well or spring water, affected by surface water	Fluctuating, occasionally occurring turbidity No DOC	<300 µm pre-filtration Ultrafiltration	1280 - 1920 l/h (5.5 – 8.4 gpm)
	Fluctuating, occasionally occurring turbidity with DOC	<300 µm pre-filtration Ultrafiltration with CIP*	1280 - 1600 l/h (5.5 – 7 gpm)
Surface water or well or spring water strongly affected by the surface water	Continuous turbidity and DOC	<300 µm pre-filtration Flocculation Ultrafiltration with CIP* In some cases the utilization of a media filtration before the UF is recommended)	960 – 1280 l/h (4.2 – 5.5 gpm)
Swimming pool water	Pathogens and DOC	Hair removal (disk filter) Flocculation Activated carbon Ultrafiltration with CIP*	2240 – 2560 l/h (9.8 – 11.2 gpm)

CIP: "cleaning in place", automatic cleaning, fixed installation. Either with an acid/base combination, sodium hypochlorite or other chemicals.

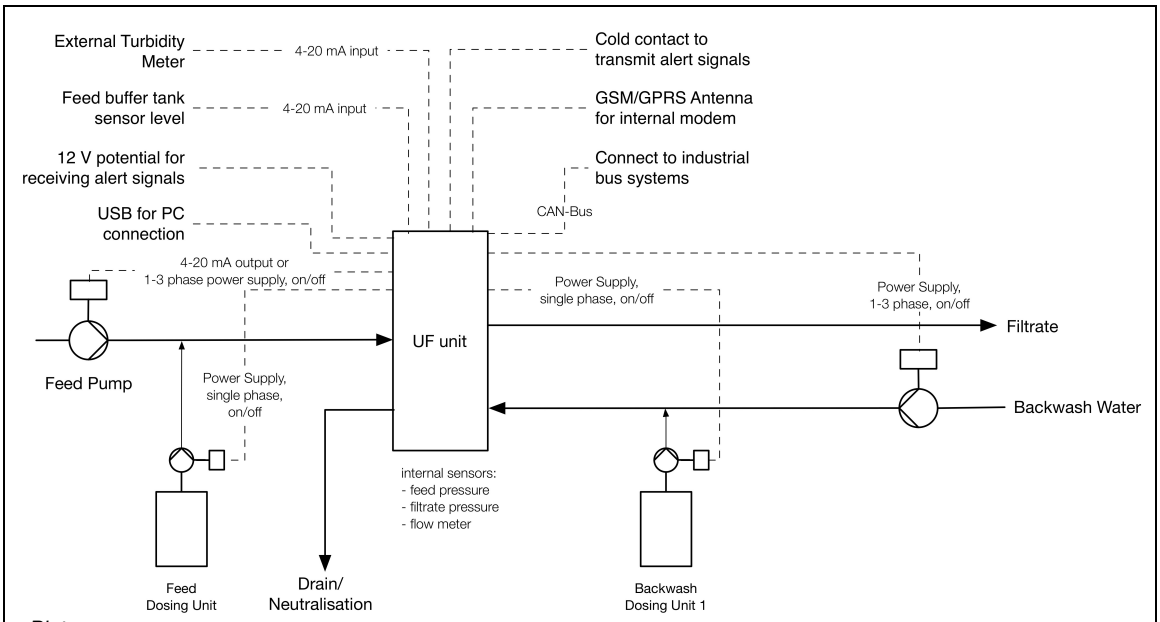
4) Hydraulic and electrical connections

a) Connection of individual systems

Individually operated Virex systems are able to control and monitor peripheral equipment. The following schematics show in which manner the equipment can be connected. An optionally available Connectivity Kit is required for the Virex Pro 1000 to connect peripheral equipment to the system.



Picture 1: A Virex Pro 1000 system with an inlet pump, a dosing pump in the inlet, a backwash pump and chemical dosing pump for automatic cleaning.



Picture 2: A Virex Pro 1000 system with an inlet pump, a dosing pump in the inlet, a backwash pump and chemical dosing pump for automatic cleaning.

b) Hydraulic connections

Hydraulic connections	Description	Connection
Inlet (Feed)	Connection of the raw water. A <300 µm pre-filter should be installed upstream of the system.	Virex Pro: 3/4“ internal thread
Filtrate	Filtrate outlet, supplies pure water.	Virex Pro: 3/4“ internal thread
Backwash	This connection is utilized by the pump or membrane receptacle during backwashing in order to press filtered, pure water through the system. At this location there should be 2.5 bar/36,26psi of pressure during backwashing and 0 bar/0psi during filtration.	Virex Pro: 3/4“ internal thread
Outlet (Drain)	Rinse water of the system. During pure water rinsing, the rinse water can be lead into draining canals or the canalization, during chemical cleaning and the addition of chemicals during filtration, for instance a neutralization of the rinse water must be performed.	Virex Pro: 3/4“ internal thread

3.3 Electrical connection

Voltage	Power (w/o peripherals connected)	Frequency
12VDC	55 W	
120 V		50/60 Hz
230 V		50/60 Hz

Warning:

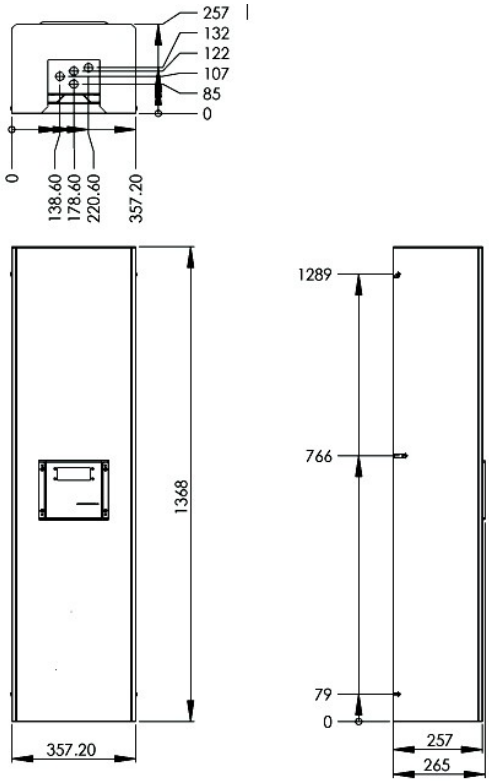
Electrical shock!

- Follow the instructions in this manual!
- Failure to do so can cause serious injury or death!
- All electrical connections must be compliant with local ordinance and/or DIN/VDE directives!
- Do not change the connecting plug or the connecting cable!
- Do not use extension cords!
- Before opening the cover, always disconnect the system from the power supply (pull the power supply plug)!

4. System Description

4.1 Dimensions and weight

The systems are fitted with two ultrafiltration modules each. The system is disassembled for transport, as the filter modules may not be transported while fitted to the system. The filter modules are packaged separately and enclosed with the system.



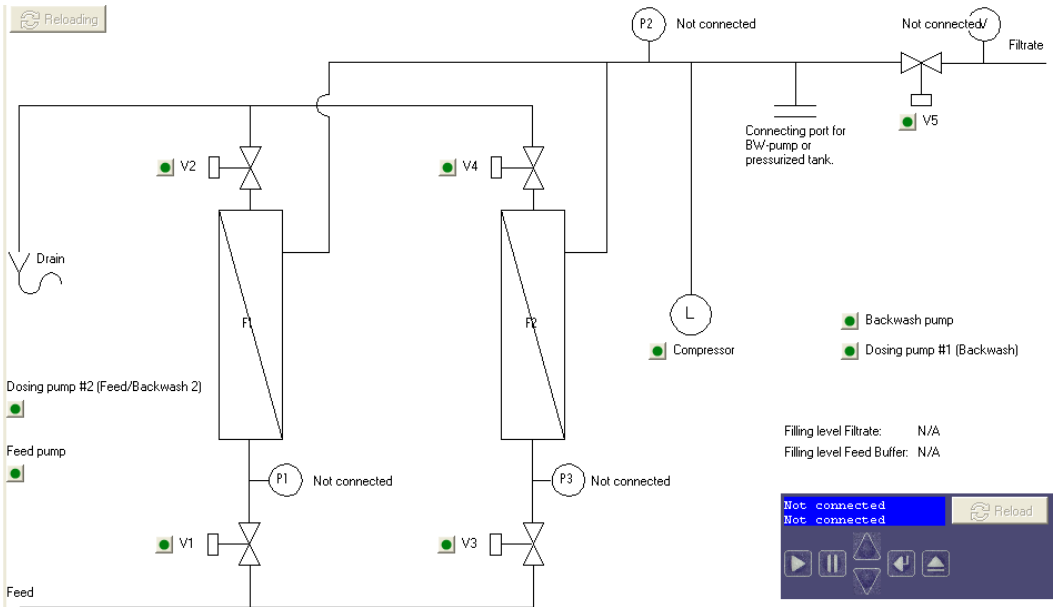
Picture 3: Virex Pro 1000 (dimensions in mm)

4.2 System Description

The systems are always equipped with two filter modules, among others this has the advantage that the systems can perform a mutual backwash (one filter module backwashes the other alternately). All valves are integrated in a valve block, which also houses the pressure sensors as well as the flow meter and the connection of the compressor.

The schematic shown below shows P&ID of the system, whereby the pumps shown in the diagram are not part of the system and must be installed separately.

1) Process and Instrumentation diagram (P&ID)



Picture 4: Hydraulic schematic with valve arrangement

2) Denotation of sensors and actuators of the system

P1	Pressure sensor inlet, filter 1
P2	Pressure sensor, filtrate, upstream of V5
L	Compressor
V1	Inlet valve, filter 1
V2	Drain valve, filter 1
V3	Inlet valve, filter 2
V4	Drain valve, filter 2
V5	Filtrate valve

4.3 Electronics

1) General

The systems are delivered with or without a "Connectivity Kit". The Connectivity Kit offers a variety of electrical connection possibilities. If you should not own a Virex Pro 1000 with a Connectivity Kit, this can be retrofitted at any time without larger technical effort.

Note:

The relays in the Connectivity Kit are designed to handle 16 A during operation. Consider starting currents of pumps!

2) Power supply

The the power supply of systems without Connectivity Kit is done through the enclosed power supply cable. If the kit is installed, the system is connected via the Connectivity Kit.

Systems fitted with the Connectivity Kit are supplied with a 3m long power supply cable with plug by standard.

This is how to connect the Connectivity Kit to a single phase supply.

	Connect to Connectivity Kit	
	Strip	**Pin**
Phase 1	X8	1
Neutral wire	X8	4
Ground	X8	5

In case pumps supplied through 3-phases are being connected to the Connectivity Kit, the kit's power-supply itself needs to be wired to a 3-phase supply.

	Connect to Connectivity Kit	
	Strip	**Pin**
Phase 1	X8	1
Phase 2	X8	2
Phase 3	X8	3
Neutral wire	X8	4
Ground	X8	5

Note:

Protection of the system through circuit breakers must be installed outside of the system. If pumps are connected to the Con - nectivity Kit through their power supply, it is recommended to use pumps with integrated dry running protection or protect stand - ard pumps by a float switch against running dry. Additionally a motor protection circuit breaker should be integrated in between the Connectivity Kit and the Pump.

3) Overview over the electrical connections

In connection with the Connectivity Kit, the control unit of the system offers the possibility of controlling various peripheral equip - ment (such as pumps, dosing pumps, measurement equipment) as well as the evaluation of input signals of external measurement equipment and the forwarding of alarm signals.

The equipment is connected through connector blocks to the Connectivity Kit of the system. The terminals are opened by pressing the clamping lever backwards. The stripped cable can then be inserted and releasing the lever closes the terminal, which estab - lishes the connection.

The chapter "Connecting pumps and cleaning equipment" (page 21 ff) describes the installation of pumps, cleaning equipment and other accessories.

4) Map of Connectors in the Connectivity Kit

Configuration of the „Connectivity Kit“ Seccua-Art. 10305 (Relaisbox)

Connection for 42-pin connector plug / cable loom
between SeccuaControlPro (10304) and Connectivity Kit

10484 *cable loom „Phoenix“*
10555 *cable loom „VirexPro m. Relaisbox“*

Block	Pin	Voltage / Current	Description
X5	1	12 V	Uc Turbidity Sensor
	2	In 4 – 20 mA	Turbidity Sensor
	3	12 V	UC Flow Sensor
	4	In 4 – 20 mA	Analog Flow Sensor
	5	Frequency	Digital Flow Sensor
	6	-	Analog GND
	7	12 V	Uc Alert Contact
	8	In (0V, 12V)	Alert Contact
	9	In 4 – 20 mA	Buffertank Level
	10	12 V	Uc Buffertank Level
	11	-	GND Feedpump
	12	Out 4 – 20 mA	Feedpumpe
	13	Out 4 – 20 mA	Volumetric Flow
	14	-	GND Volumetric Flow
	15	12 V	DOUT Alert
	16	-	GND Alert
X6	1	Cold Contact	Relais Alert 1
	2	Cold Contact	Relais Alert 2
	3	12 V	Uc
	4	-	Analog GND
	5	-	GND
X7	1	12 V	Uc
	2	12 V	Uc
	3	-	Analog GND
	4	-	Analog GND
	5	-	GND
X8	1	230 V (110 V / 16 A)	L1
	2	230 V (110 V / 16 A)	L3
	3	230 V (110 V / 16 A)	L2
	4	-	N
	5	-	PE

Block	Pin	Voltage / Current	Description
X1	1	-	--
	2	-	--
	3	-	PE
	4	-	N
	5	230 V	L1
X2	1	-	PE
	2	-	N
	3	230 V	Valve 5 Out
	4	-	PE
	5	-	N
	6	230 V	Valve 4 Out
	7	-	PE
	8	-	N
	9	230 V	Valve 3 Out
	10	-	PE
	11	-	N
	12	230 V	Valve 2 Out
	13	-	PE
	14	-	N
	15	230 V	Valve 1 Out
	16	-	PE
X3	1	-	N
	2	230 V	BW Out L1
	3	-	PE
	4	-	N
	5	230 V	Dosing Feed Out
	6	-	PE
	7	-	N
	8	230 V	Compressor Out
	9	-	PE
	10	-	N
	11	230 V (110 V / 16 A)	Feed Out L3
	12	230 V (110 V / 16 A)	Feed Out L2
	13	230 V (110 V / 16 A)	Feed Out L1
	14	-	PE
	15	-	N
	16	230 V	Dosing BW Out
X9	1	-	PE
	2	-	N
	3	230 V (110 V / 16 A)	BW Out L3
	4	230 V (110 V / 16 A)	BW Out L2
	5	230 V (110 V / 16 A)	BW Out L1

Picture 5: PIN assignment Connectivity Kit (relay box)

5) Tightness

The minimum protection class of the System:

Unit	Tightness	Notice
Control box	IP 54	Valid if all connections are done and the USB plug is closed.
Connectivity Kit	IP 54	Valid if all connections are done and the USB plug is closed.
Plugs and harness	IP 67	Valid if all connections are done and the USB plug is closed.

Please ensure that all PG screws, which have not been assigned, are covered with a corresponding blind plug.

5. Installation

5.1 General instructions

Ensure that your shipment is complete and undamaged.

Note:
If your delivery is damaged or incomplete, please contact our service desk immediately.

5.2 Electrical checklist

Please make sure that the available electrical supply (power supply cable and socket) corresponds to the requirements of the system.

To protect the system, a fuse has been installed in the inside of the control unit (6A, 250W).

After wall-mounting of the control unit, connect the control unit of the system to the power supply with the enclosed power cable.

Warning:
All electrical connections must be compliant with local ordinance and/or DIN/VDE directives!

Warning:
Caution: electrical voltage!

The power supply to the system must be interrupted before carrying out work on the control unit or the relay box. Always disconnect the power supply before opening the cover!

Warning:
Electrical shock!

- Follow the instructions in this manual! Failure to do so can cause serious injury or death!
- Do not change the connecting plug or the connecting cable!
- Do not use extension cords!
- Before opening the cover, always disconnect the system from the power supply (pull the plug)!

5.3 Checklist casing

Note:
The system has been designed for a maximum water temperature of 40 °C/104°F. Additionally, the temperature of the water in the inlet should not drop below 4 °C/39°F.

Note:
To ensure smooth filtration operation and in order to prevent membrane damage due to rough particles, a pre-filter (max. 300 µm) must be installed upstream of the system!

5.4 Required tools and material

The following tools and materials are required for wall- and in-line mounting:

- Drill, screws, wall plugs
- Screwdriver
- Ratchet
- Torque wrench 5Nm
- Pipe wrench
- Measuring tape
- Bucket
- Chlorine tablet
- Computer or notebook with the current control software and a USB cable,

- Teflon tape or equivalent degreased sealing agent certified for use with drinking water.

Additionally, we recommend carrying out the connection of the system to the fixed installed pipeline network with flexible hoses (3/4") certified for use with drinking water.

Warning:

Please observe all the relevant regulations at the time of installation!

The pressure in the system may not exceed 5.0 bar/72,52 psi! If necessary, please install a pressure reducing valve to reduce the water pressure upstream of the system.

Note:

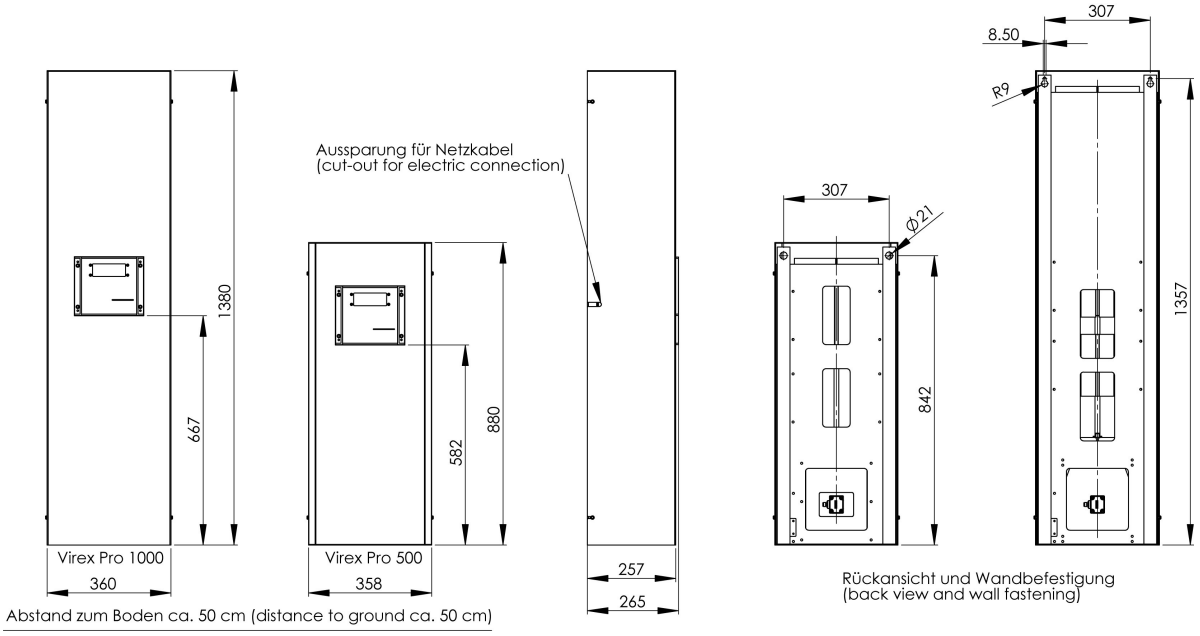
We recommend that the system be installed and commissioned by an authorized service partner.

Mounting instructions:

Please check following points before mounting the device:

- Are all the necessary water connections available (feed, filtrate, drain water)?
- Is there a drain available at the location of installation ?
- Is the required electrical connection present (12 V DC(optional), 110 V AC, 230 V AC)?
- Please check whether the wall intended for mounting is suitable to carry the weight of the system (see chapter 4.0 "Dimensions and weight")
- Is there sufficient space on the front side of the system to allow easy operation of the control unit and carrying out of servicing and maintenance?
- Take sufficient space below the system into consideration in order to fit and connect the inlet and outlet lines.
- Ensure a sufficiently secure mounting of the system to the wall and take the weight of the system (up to 70 kg/154,3 lb when filled) into consideration!

The following mounting possibilities are available for the wall-mounting of the system on the back:



Picture 6: Wall-mounting of the systems, side and rear view (dimensions in mm)

Note:

We recommend a distance between the bottom edge of the system and the floor of at least 50 cm (approx 20 in).

5.5 Water connections of the system

The systems are easily mounted and integrated into existing piping systems. All inlets and outlets of lines are located on the bot-

tom of the system and are fitted with a uniform 3/4" thread. We recommend the use of flexible metal fabric hoses ("flexible hoses") in order to connect the system with the piping system.

Use a commercial Teflon tape graded for use in drinking water installations or permissible Teflon tape or silicone tap grease for sealing the connection threading. Do not use sealants based on natural grease – these can lead to strong bacteria growth.

Note:

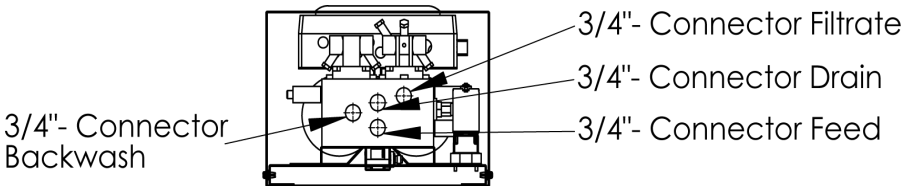
We generally recommend installation of a shut-off option or a stop valve in the inlet of the system, in the rinse water and in the fil - trate line. This simplifies later maintenance and cleaning work.

Install the unit with detachable connections to be able to remove or exchange the unit later.

Warning!

Make sure that the room in which the system is installed is equipped with a working floor drain!

1) Overview over the water connections



Picture 7: Overview of the connections of the systems Bottom view (the front is at the top)

2) Feed line

The system has been designed for a maximum water temperature of 40 °C (104°F). Additionally, the temperature of the water in the inlet should not drop below 4 °C (39°F). Generally, depending on the raw water quality upstream of the system, a strainer must be installed for pre-filtration with a cut-off of 100µm - 300µm.

It is also strongly recommended to install a check-valve into the feed-line of the unit to prevent backward flow which could occur e.g. in times of standstill of the feed-pump. This can also improve the backwash performance in some cases.

Warning:

Even at maximum filtrate performance, the pressure difference between the inlet and filtrate side may not exceed 2.5 bar (36 psi). The maximum operating pressure in the feed line (dead head) must under no circumstances not exceed 5 bar (72,52 psi)

3) Filtrate line

Note:

It must be ensured that the filtrate can be discharged downstream of the system in case needed. An operating pressure of between 0.5 – 2.5 bar (7.2 psi – 36.3 psi) must be provided for filtration. A sampling valve must be mounted right downstream of the installation!

It is also strongly recommended to install a check-valve into the filtrate-line of the unit to prevent backward flow which could occur e.g. in times of standstill of the feed-pump.

4) Drain line

The drain line is required in order to discharge the water occurring during cleaning of the unit.

Please ensure to size the drain-line big enough to handle a flow of up to 1 Liter per Second (16 gpm). Please make sure to install the drain-line according to local plumbing codes and that no back-flow can occur. Therefore, route the drain line without any unne - cessary bends and use adequately dimensioned pipe.

Note:

An open separation must be provided between the system drain and the drain line in order to prevent re-contamination of the system due to drain water → free drain, in accordance with DIN 1988, Part 4 (Design Classification A, as per European Standard EN1717) or similar regional plumbing codes.

Important:

Should the drain-line be installed so it rises above the upper edges of the unit, a permanent counter pressure builds up in the unit's drain-line. This counter-pressure is not relevant during cleaning or filtration. Nevertheless such counter-pressure has to be considered during automated integrity testing, and the test-pressure p_{test} has to be increased by the additional counter-pressure.

5) Backwash line

The backwash-line is referred to as the line, with which the system is backwashed against the direction of filtration. Pure water (=filtrate) on the filtrate side is pressed back through the membranes. Backwash typically uses a separate pump, delivering water from a filtrate tank to the unit at a defined pressure and flow.

The unit's connection for the backwash line is either equipped with a built-in check-valve, or a check valve is attached that you have to install, in order to ensure that no water can escape at this location during filtration.

Important:

The Backwash pump of a Virex unit should be designed to deliver a flow of 30 l/min (8 gpm) at a flow pressure of 2.5 bar (36 psi) at the Backwash-port of the unit. In case of severe fouling of the membranes, the required pressure to efficiently backwash the membranes can be even higher.

5.6 Connecting pumps and cleaning equipment

Pumps and cleaning equipment can only be connected to a Connectivity Kit. If the system is not fitted with this kit, please skip this chapter. The Connectivity Kit itself is connected to the power mains following connection of all peripheral equipment, as described in chapter 4, "Map of Connectors in the Connectivity Kit".

1) Connection of a switched feed- pump

	Connection Connectivity Kit	
	Connector block	**Pin**
Phase 3 (if present)	X3	11
Phase 2 (if present)	X3	12
Phase 1	X3	13
Ground	X3	9
Neutral	X3	10

The power supply of the pump is performed via the Connectivity Kit. Max. current per phase 16 A. In order to supply a 3-phase switched feed-pump through the Connectivity Kit, the Kit must be connected to a 3-phase power-supply itself.

2) Connection of a frequency-controlled inlet pump

	Connection Connectivity Kit	
	Connector block	**Pin**
Control signal 4-20 mA	X5	12
Ground for analog signal	X5	6

If existing, the feed-pump's variable speed drive can be supplied with a 4-20 mA signal, which can be programmed to either soft-start the unit, run it at a fixed flow or match the filling-level of a feed-buffer-tank (low level, low speed and vice versa).

3) Connection of dosing pump 2 for feed or backwash (DO6)

	Connection Connectivity Kit	
	Connector block	**Pin**
Grounding	X3	3
Neutral conductor	X3	4
Phase 1	X3	5

This digital port is used to supply power (single phase, max. 16 A) to a dosing pump, which can be either used to dose a second chemical during the sequence of a chemically enhanced backwash, or to dose a chemical into the feed of the unit during filtration (function is determined in the software-settings).

4) Connection of the level signal of a feed-buffer or filtrate -tank

	Connection Connectivity Kit	
	Connector block	**Pin**
Input signal 4-20 mA	X5	9
Ground for analog signal	X5	6

Regulation of the inlet pump according to fill height (high speed at high fill height, low speed at low fill height). During a forward-flush of the unit, the incoming signal of the feed-buffer-tank is over-ridden and the unit always puts out 20 mA to the feed-pump (if connected to the Virex Pro's 4-20 mA signal).

Alternatively, once a level meter that monitors a filtrate tank is connected to these connectors, filtration can be stopped when programmable levels in the filtrate tank are reached and cleaning cycles are only started if enough water for backwash is still available.

5) Output of the volumetric flow measured by the unit

	Connection Connectivity Kit	
	Connector block	**Pin**
Output signal 4-20 mA	X5	13
Ground for analog signal	X5	14

Signal can be used e.g. for the control of a filtrate-aeration-system, a residual chlorine-dosing system or similar.

6) Connection of a turbidity-meter

	Connection Connectivity Kit	
	Connector block	**Pin**
Input signal 4-20 mA	X5	2
Supply voltage 12 V	X5	1

The read-in values are saved in the data logger and can be used to trigger a direct-membrane-integritytest.

7) Reading of an external alarm signal

	Connection Connectivity Kit	
	Connector block	**Pin**
Input 0 V / 12 V	X5	8
GND	X5	6

Input closed = measured 0V = no alert; Input open = measured 7 to 12V = alert (measured between X5/Pin 8 & X5/Pin6)

The Virex Pro 1000 control monitors external cold contacts using a 12 V potential between X5.8 and X5.6. If the potential between X5.8 and X5.6 is 0V, the controller interprets that as “no error”, if the potential rises to 7 to 12 V the controller interprets that as “external error”.

8) Output of an alarm signal

	Connection Connectivity Kit	
	Connector block	**Pin**
Input voltage 12 V	X5	15
Ground alarm	X5	16

12VDC = No Alarm; 0V = Alarm

The Virex Pro can signal an alert by putting out a 12 V signal between X5.15 and X5.16.

9) Output of an alarm signal through a potential-free contact

	Connection Connectivity Kit	
	Connector block	**Pin**
Potential-free contact	X6	1
Potential-free contact	X6	2

This contact may be used as a Enable-/Disable contact to drive frequency converter for example. The contact is closed during normal operation of the unit and opened upon an error.

10) Connection of a switched backwash pump

	Connection Connectivity Kit	
	Connector block	**Pin**
Grounding	X9	1
Neutral conductor	X9	2
Phase 3 (if present)	X9	3
Phase 2 (if present)	X9	4
Phase 1	X9	5

Each phase can draw a max. of 16 A during operation. In order to supply a 3-phase Backwash-pump through the Connectivity Kit, the Kit itself has to be connected to a 3-phase power-supply.

11) Connection of the dosing pump 1 for the chemical dosing during backwash

	Connection Connectivity Kit	
	Connector block	**Pin**
Grounding	X3	14
Neutral conductor	X3	15
Phase 1	X3	16

This dosing pump is the first pump that is addressed during a chemically enhanced Backwash. It can also be used as the only pump being used during such a cleaning sequence, e.g. in case only NaOCl is used to enhanced every X^{th} Backwash.

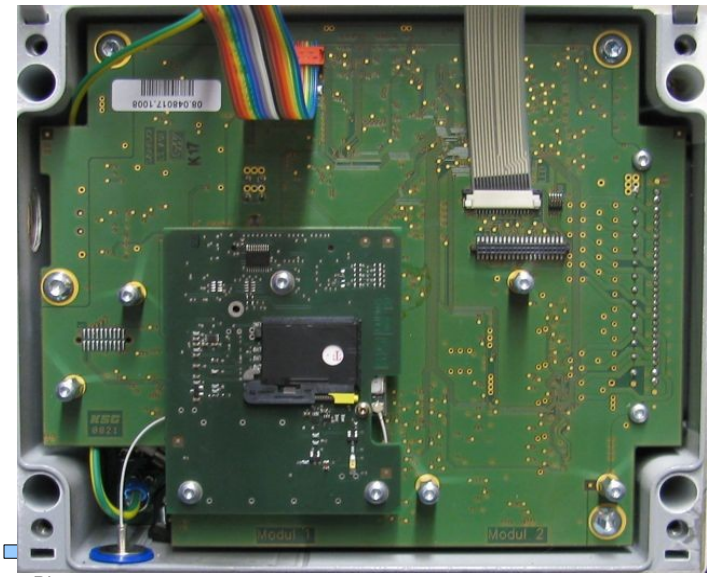
5.7 Installation of a modem

Note:

Ensure that the power supply to the control unit has been disconnected and you are grounded in order to prevent damaging the Modem and the control unit due to static charges. Please use ESD safety precautions.

Perform the following to install an internal modem in the control unit:

1. Remove the plastic cover strip on the left and right-hand side of the control unit.
2. Open the visible screws that are located at the top (the upper and lower), fold the cover of the control unit upwards and fix it in place to prevent it from closing on its own or falling down. Be careful to not pull out the flat band cable from the operating panel.
3. Insert the SIM card into the modem.
4. Loosen the screws on the corresponding spacer on the printed circuit board.
5. Connect the thin antenna cable on the side of circuit board, on which the connector for the connection to the main board is located (small connector).
6. Insert the modem in the circuit board and secure it with the screws of the spacers (see diagram below).



Picture 8: Opened control unit with fitted modem module and SIM card. The inserted antenna cable is also visible.

7. Insert the antenna cable to the antenna connector on the outside of the housing.
8. Reconnect the control unit and secure the screws of the cover. While securing ensure the correct seating of the seal.
9. Now configure the modem as described further below.

Note:

If the SIM card has been installed in the control unit, the control unit may not be started more than three times without entering the correct PIN number in the PC software or else the SIM card will be blocked. This card must then be inserted in a cellular phone and re-enabled through entering the available PUK number (which you will receive from your service provider).

First you should configure the PIN number, as described in chapter "Configuring an internal modem" under 8.2 (page 43).

5.8 Installation of filter-modules

1) Required tools and materials:

a) Tools

- Hexagon socket wrench 6mm;
- Torque wrench 5 Nm;
- Bucket

b) Materials

- 2 x O-Ring (Sealing Module/Adapterblock)
- 2 x Filter-modules
- 6 x Screws M8x16
- 3 x brackets
- 2 x Cap SMP,
- 2 x O-Ring 98x4
- 4 x bracket,
- 8 x Screws M8x50

2) Preparing

1. Put the O-Rings into the grooves of the adapter-block.
2. Unpack the Modules carefully. Drop the preservative agent in the bucket by holding the Module with the Pipe end below.

3) Inserting Modules

1. Put the O-rings 98x4 into the grooves of both end caps.
2. Attach the end caps to the plain end of the new filter modules
3. Fix the caps with the brackets and the screws M8x50. Max Torque 5 Nm!
4. Put the Modules into the adapter block with the pipe ends below. Please be careful!
5. Insert the pipe ends fully into the adapter block.
6. Fit the brackets into the nut of the module and fix them by using the Screws M8 X 16. Tighten the screws by hand.
7. Tight the screws crosswise by using the 6mm hexagon socket wrench.

Warning:

Do not apply a torque greater than 5 Nm! Substantial damage to the unit and/or water leakage can result from it.

5.9 Rinsing and commissioning

1) General

Before commissioning of the system please first ensure that all impurities are removed from the connection lines in order to avoid damage to the membrane and to guarantee a maximum filtrate quality.

Note:

It must be ensured that the pipeline network between the system and the points-of-use is disinfected after installation.

All systems are disinfected and preserved before they leave our factory. However, it is possible that re-contamination occurs at the installation site! Additionally, the filter modules are delivered with natural food preservative solution. This must be rinsed out before commissioning of the system.

Note:

Please ensure that no metal, plastic particles or oil residues remain in the connection line, as these can damage the membrane capillaries. Any deposits and debris must be removed before connection to the system!

2) Rinsing of the system

Proceed as follows to remove any impurities from the feed line (especially plastic or metal particles):

1. Remove any visible deposits or installation residue from the feed and filtrate lines of the system.
2. Connect the system to feed-, filtrate and drainlines as described above.
3. Turn on the power supply of the system (connect the mains plug).
4. If necessary, program the control unit according to the instructions (see page 27 ff "Operation and Programming").

Note:

Please ensure that the filtrate is discharged during commissioning and the rinsing procedure and that it does not reach the over - head tank or the supply mains.

5. Start the filtration mode by pressing the "Start" button.
6. Let the system continue to operate in the filtration mode until the entire preservative has been rinsed out (typically this takes around 20 minutes or a water amount of approx. 2 m³ / 530 USgal per system).
7. Stop the system by pressing the "Stop" button.

3) Disinfection of the ultrafiltration system

The entire system must be disinfected following the rinsing activity as described above.

Warning:

Make sure to take the necessary pre-cautions measures when handling cleaning chemicals, such as chlorine. Always wear safety goggles and protective gloves and clothing. Follow the safety datasheet as supplied with the cleaning chemicals.

Procedure:

1. It is recommended to disinfect the Ultrafiltration system after installation. You can do that by putting a chlorine tablet in the pre-filter upstream of the unit (unscrew and insert). Make sure the concentration of free chlorine in the system does not exceed 20 ppm during the disinfection process.
2. Rinse the system by filtering water until the water at the next outlet downstream of the system shows a smell of chlorine (or a concentration of free chlorine of approx. 20 mg/l can be detected). Do not feed the chlorine into your distribution system, make sure to safely discharge the disinfection solution.
3. Now stop the system (see description) and let it sit and soak for approx. 30 minutes, while filled with chlorinated water.
4. Restart the filtration (remove any possible residue from the chlorine tablet in the pre-filter) and keep discharging the wa - ter in the filtrate of the system until no chlorine smell can be detected any more.
5. The disinfection is now complete.
6. You can now put the unit back into operation and direct the filtrate into the line network.

Note:

All cleaning and disinfection chemicals must be NSF 60 certified!

4) Commissioning

To finalize the commissioning you have to use the PC software to calibrate the sensors and adapt the cleaning options if necessary.

6. Operation and Programming

6.1 Overview of the operating modes

The operation of the Virex ultrafiltration system is differentiated into various operating modes.

A defined sequence of different operating modes is referred to as a filtration cycle. After a certain number of passes of the filtration cycle a chemically supported backwash can be performed.

In the case of water with varying quality (e.g. surface influenced wells) the system is operated depending on the degree of membrane fouling in order to enable an optimal adaptation of the operation of the ultrafiltration system to the quality of the feed water.

Name	Description
De-aeration	Removal of air from the system before filtration
Filtration	Filtration of water by the membrane filter
Backwashing (internal or through pump or pressurized tank)	Filters are rinsed against filtration direction
Optional: dosing of a cleaning chemical #1	Optionally, if cleaning equipment installed
Optional: Clean-water backwash	Flushing of the membrane filter with filtered water after chemical dosing #1.
Optional: dosing of a cleaning chemical #2	Optionally, if cleaning equipment installed
Optional: Clean-water backwash	Flushing of the membrane filter with filtered water after chemical dosing #2.
Rinsing	Forward Flush with raw water
Direct Integrity Test	Automatic examination of the membrane filter for damage

6.2 Filtration

The actual ultrafiltration takes place in the operating mode “Filtration“. Water is forced from the inlet side (feed) into the membrane capillaries and through the membrane fiber walls onto the filtrate side (filtrate).

1) Filtration length depending on the quality of the raw water

By default, the unit's filtration parameters are configured as follows:

Parameter	Unit	Default setting
Min. Filtration Duration	Minutes	20
Max. Filtration Duration	Minutes	60
Automatic start of a cleaning cycle when membrane performance drops to (compared to new membranes)	%	90

Using those standard setting, the unit will filter no shorter than 20 minutes and not longer than 60 minutes before starting a cleaning cycle. In between those boundaries, the unit will trigger a cleaning cycle as soon as the membrane fouling drops the system performance to 90% compared to new membranes.

Note:

Please note that the above mentioned information is only intended as an adjustment guideline. The actual applicable settings depend only on the quality of the raw water at-site and can deviate considerably from the table shown above.

2) Removal or Reduction of DOC from the raw water

DOC (dissolved organic carbon) describes the organic components dissolved in the raw water. These occur among others when the raw water originates from wetlands, forests or fertile catchment areas. Additionally, streams, rivers and similar bodies of water contain DOC.

When DOC is present in the raw water, the fouling layer, which forms during filtration on the membrane, cannot be removed with pure water backwashes alone and instead alkaline cleaning agents must be used.

3) Sample filtration cycle

1. Filtration (pure water generation)
2. Forward flush
3. Backwash F1
4. Backwash F2
5. Forward flush

6.3 Cleaning

The set-up of the various cleaning possibilities and backwashing times depend on the quality of the raw water.

The more turbid the water, the more frequently the membranes must be clreaned. If organic carbon compounds (often referred to as TOC or DOC in the analysis) are present in the raw water, it is recommended to either remove these substances upstream the ultrafiltration or by regular cleaning of the system (either manually or automatically) with the utilization of cleaning chemicals.

Note:

You can find guiding values for setting of the cleaning parameters listed below. However, please note that the optimal settings for your particular system can deviate from these specifications!

1) Standard settings of the system

The Virex Pro system is set to the following default factory settings:

1. Triggering of a cleaning cycle
   a) in the case of a drop in filter performance to 90 % (the proportion of flow to the required pressure) to 90% of the ini - tial performance and
   b) at least every 60 minutes, but
   c) not more often than every 20 minutes.
2. A cleaning cycle consist of:
   a) Forward flush (10 seconds),
   b) followed by internal backwashing (60 seconds per module),
   c) followed by a forward flush (10 seconds).

2) Monitoring of the cleaning efficiency

Following the end of a cleaning cycle the system switches back to filtration and performs an immediate evaluation of the degree of fouling of the filters in order to monitor the cleaning efficiency of the system. If this rate of efficiency lies below the required, to be set percentage ("Minimum Q/dp after cleaning", default 80%), the control unit will automatically trigger an error message (Fi08).

3) Forward flush

During a forward flush, the membrane fibers are flushed alongside the inside of the membrane, from the feed to the drain side of the filter. No water flow takes place through the membrane. The forward flush takes loose fouling layers out of the membrane fibers. It should be performed at a high flow speeds and have a duration of approx. 10 seconds.

It has to be assured that the flow during a forward flush of a Virex Pro 1000 can reach up to 27 Liters per minute or 7gpm. In case that filtration takes place at a low flow rate, it might be necessary to ramp up the speed of the feed-pump during a forward flush in order to achieve such high flow. In such case the feed-pump of the system needs to be equipped with available speed-drive which is connected to the 4-20 mA feed-pump-signal of the system. The system then ramps up the feed-pump signal to 20 mA during a forward flush.

4) Backwash (BW)

During Backwash the filtration flow is reversed and filtered water is pressed from the filtrate side through the membrane to the inlet side (feed) from where it is routed into the drain.

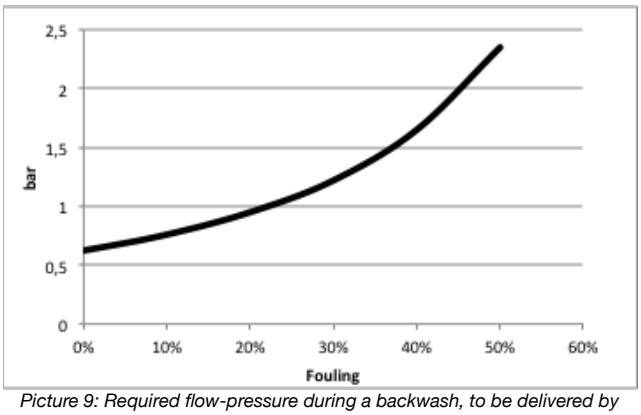
There are several possibilities of backwashing:

1. Internal backwash of filter units. The filters backwash themselves one after the other, whereby one element produces the water to backwash the other one. Internal backwashes only work with clean feed-water.
2. The filter modules are backwashed by a pump, which is connected downstream of the system and draws water from a filtrate tank (a Connectivity Kit is required for this operation).
3. The unit is backwashed from a permanently pressurized line (e.g. a supplies main or a pressurized tank). In such case a

normally closed solenoid valve has to be installed between the pressurized line and the unit, which is connected to the unit's Connectivity Kit and controlled like a BW-pump.

a) Backwash through downstream pump

During a backwash through a pump, the two modules of a Virex unit are backwashed separately in a sequence. The flow that has to be delivered by the Backwash-pump has to achieve 30 – 33 Liters/minute (7.9-8.8 gpm) at a flow-pressure, measured at the unit's backwash-port, as can be seen from below diagram:

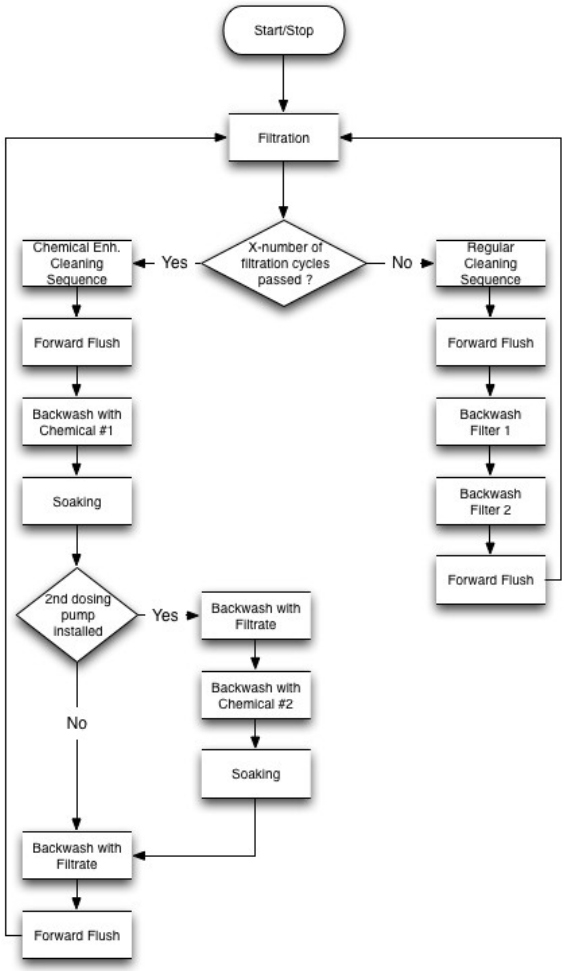


Picture 9: Required flow-pressure during a backwash, to be delivered by backwash pump at unit, depending on membrane fouling.

Note:
Backwash pumps must be connected to the unit's Connectivity Kit. They can only be switched on and off.

b) Chemically Enhanced Backwash (CEBW)

During the chemical cleaning of the system, the filter modules are rinsed and cleaned with a solution of pure water and cleaning chemicals. The rinse water contains a high or low pH value, often with further added cleaning agents, which may not be released into the drain water without neutralization.



Picture 10: Flow chart of filtration and cleaning

5) Manual chemically enhanced Cleaning-in-Place (CIP)

A chemically enhanced Cleaning-in Place is typically required one up to four times per year. Depending on the water quality it may be required more often in some cases.

a) Required tools and materials

- Safety glasses
- Safety clothes and gloves
- Chemical resistant pump, up to 35 Liters per min (9.2 gpm) at max. 3 bar (43.5 psi)
- Chemical resistant tank with top inlet and bottom outlet (PE or similar, 100 Liter, 26.3 Usgal)
- Flexible hose, chemical resistant (PE in-liner), safe and chemical resistant hose-couplings
- Cleaning chemicals

Note:
Please make sure all used cleaning chemicals match the required drinking water standards (e.g. NSF 60 in the USA).

Note:
Make sure you install your Virex Pro so the inlet and outlet required during a CIP can be easily connected later.

Warning!

Please make sure you follow the Material and Safety Datasheets (MSDS) of the cleaning chemicals you work with. Always wear safety glasses, safety clothes and other required protective gear.

Warning!

Make sure that no cleaning chemicals get into the drinking water supply! Rinse the system after cleaning thoroughly and drain the chemicals! Make sure you neutralize all chemicals before releasing into sewer or nature.

b) Procedure

Make-up cleaning solution

1. Fill the tank intended to use for cleaning with around 60 Liters of Water (approx 15 Usgal)
2. Add cleaning chemicals, choose chemicals as required
3. Mix cleaning chemicals well and measure pH of your cleaning solution with a pH-meter!

Water Source	Cleaning Agent	Important Criteria
Turbidity	Water	Flow during BW per module >30 l/min (>7.8 gpm)
DOC	Caustic / Caustic & Surfactants	pH > 13
Bacteria, Algae	Peroxide, Sodiumhypochlorite	H_2O_2: 50 mg/l NaOCl: 20 mg/l (free chlorine)
Mn, Fe	Acid & Reducing agents	Peracidic acid & Peroxide
Hardness	Acid	pH < 1,5

Warning!

Never mix NaOCl (Bleach, Hypochlorite) with acids. Lethal chlorine gas will be generated!

Important parameters for cleaning

1. Right cleaning agent applied
2. Temperature (as high as possible, but never higher than 40°C / 104 F)
3. Concentration (as strong as possible, but obey maximal tolerances of system and used piping material)
4. Soaking time (always > 30 minutes, if possible over-night)
5. Fluxrate (obey max. transmembrane pressure and max. operating pressure)

Stop filtration and drain the unit

1. Switch UF unit into Stop-mode by pushing the “Pause”-key
2. Close external feed- and filtrate valves up- and downstream of the unit (if installed).
3. De-pressurize feed- and filtrate line up and down-steam of the unit. Neither on the feed nor on the filtrate-port may there occur pressure.
4. Connect your PC to the unit via USB
5. Verify on the main screen of the PC Software, that p1 (inlet pressure) shows p1= 0 bar

Warning!

Make sure that no cleaning chemicals can reach into the drinking water supply!

6. Verify the settings of the valves in the software:

Valve	Description	Display in software	Effect if pressure in feed line is higher than in the unit, normal direction of flow
Feed valve 1	V1	V1: dark green	Closed (powered)
Drain valve 1	V2	V2: dark green	Closed (un-powered)
Feed valve 2	V3	V3: dark green	Closed (powered)
Drain valve 2	V4	V4: dark green	Closed (un-powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

7. Now change the settings of the valves according to the table below to drain the unit:

Valve	Description	Display in software	Effect if pressure in unit is higher than in the feed line, direction of flow from unit to the valves
Feed valve 1	V1	V1: green	Closed (un-powered)
Drain valve 1	V2	V2: green	Open (powered)
Feed valve 2	V3	V3: green	Closed (un-powered)
Drain valve 2	V4	V4: green	Open (powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

8. Drain the UF unit through the filtrate, drain and feed lines.

Important!

Make sure the feed line to the system is un-pressurized and there is no back-pressure on the filtrate line before you proceed! Usually there are globe valves installed upstream and downstream of the system that need to be closed.

Circulating cleaning chemicals through the unit

1. Circulate cleaning solution from feed to drain of the unit.

   A) Connect the pressurized side of the pump to the feed-side of the unit and connect the drain-side of the unit looping back to the tank holding cleaning solution. In case cleaning agents containing detergents are used, make sure no foam can build up during re-circulation.

   B) Verify the valves settings for circulation of cleaning solution through module #1:

Valve	Description	Display in software	Effect if pressure in unit is higher than feed and filtrate pressure, i.e. direction of flow from module to the valves
Feed valve 1	V1	V1: dark green	Open (powered)
Drain valve 1	V2	V2: dark green	Closed (un-powered)
Feed valve 2	V3	V3: dark green	Closed (powered)
Drain valve 2	V4	V4: dark green	Closed (un-powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

   C) Start circulation, circulate through module 1 for about 5 minutes

   D) Stop circulation

   E) Verify the valve setting for circulation of cleaning solution though module #2:

Valve	Description	Display in soft-ware	Effect when pressue in side #2 of the system is higher than feed-pressure.
Feedv alve 1	V1	V1: dark green	Closed (powered)
Drain valve 1	V2	V2: dark green	Closed (un-powered)
Feed valve 2	V3	V3: dark green	Open (powered)
Drain valve 2	V4	V4: dark green	Closed (un-powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

F) Start circulation, circulate through module 2 for about 5 minutes

G) Stop circulation

H) The cleaning solution is now left in the unit to soak for at least 30 minutes.

I) Make up new cleaning solution.

J) Repeat step 1. until the water circulated is clear.

2. Circulation of cleaning solution through the membrane (Backwashing)

A) Verify the settings of the valves in order to backwash module #2 through module #1:

Valve	Description	Display in soft-ware	Effect during filtration through side #1 to back-wash side #2 through cleaning ports #1 to #4
Feed valve 1	V1	V1: green	Closed (un-powered)
Drain valve 1	V2	V2: dark green	Closed (un-powered)
Feed valve 2	V3	V3: green	Closed (un-powered)
Drain valve 2	V4	V4: dark green	Closed (un-powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

B) Circulation of the cleaning solution for approx. 5 min.

C) Stop circulation and allow soaking for 30 minutes.

3. Neutralization of cleaning solution in the unit:

A) Neutralize the cleaning solution in the tank.

B) Repeat step 2 without the soaking and neutralize the solution continuously.

C) When the cleaning solution has been neutralized continue.

4. Backwashing with external backwash pump:

A) Verify the valve settings to perform a backwash through side #1 of the system:

Valve	Description	Display in software	Effect during backwash of side #1 through backwash pump
Feed valve 1	V1	V1: green	Closed (un-powered)
Drain valve 1	V2	V2: green	Open (powered)
Feed valve 2	V3	V3: dark green	Closed (powered)
Drain valve 2	V4	V4: dark green	Closed (un-powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

B) Turn on the backwash pump and perform a backwash for 60 seconds.

C) Turn off the backwash pump once the water does not contain turbidity any more.

D) Verify the valve settings to perform a backwash through side #1 of the system:

Valve	Description	Display in software	Effect during backwash of side #2 through backwash pump
Feed valve 1	V1	V1: dark green	Closed (powered)
Drain valve 1	V2	V2: dark green	Closed (un-powered)
Feed valve 2	V3	V3: green	Closed (un-powered)
Drain valve 2	V4	V4: green	Open (powered)
Filtrate valve	V5	V5: dark green	Closed (powered)

E) Turn on the backwash pump and perform a backwash for 60 seconds.

F) Turn of the backwash pump once the water seems not to contain turbidity any more.

5. Make up a fresh cleaning solution and repeat all steps (1 to 5), until cleaning shows no effect anymore.

Important

The final circulation step of a sleaning sequence should always be at low pH in order to remove scaling that builds up at previous high pH cycles.

Rinsing of the system and verification of permeability

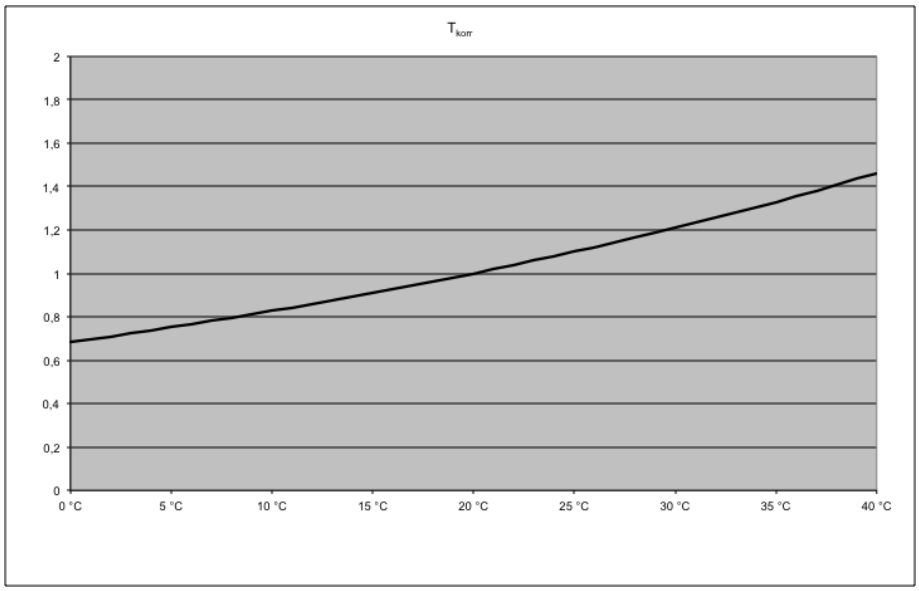
1. Reconnect the system to the feed- and drain-lines. Do not connect to the filtrate-line yet.
2. Route a hose from the filtrate-line to a drain.
3. Put the system into filtration mode and make sure water flows through the system and into the drain.
4. Make sure to rinse the system with at least 400 Liters (105 USgal) of water.
5. While rinsing the unit, verify the success of your cleaning action. Use the flow indication (Q) and the differential pressure (dp) indication, both from the display of the unit, to calculate the Permeability of the membrane:

$$P = \frac{Q}{dp \times A \times Tkorr}$$

wherein

Q has to be put in in l/min (1 gpm = 3,78 l/min),
dp in bar (1 bar = 14.5 psi, 1 psi = 0.069 bar)
A in m^2 (=16 m^2 for Virex Pro models 2010 and later)

The Temperature correction factor T_{korr} can be taken from below graph:



Picture 11: Temperature Correction Factor

The permeability of a new Membrane typically is min. P=400 l/(m² h bar) at T=20°C. By experience this value will not be fully achieved after a chemical cleaning, membrane modules will stabilize over time at 75% of its initial performance.

6. If the performance and cleaning efficiency where not sufficient, repeat cleaning.
7. Re-connect the system to the filtrate line
8. The cleaning has been completed successfully!

6.4 Membrane test (integrity test)

1) General

Among others, membrane damages can be caused by pressure shocks (water hammer), which then lead to a reduced pathogen-reduction capability of the system. In order to assure long term safety the system offers an integrated, fully automated direct membrane integrity test. Within the Seccua units, this test is done as a pressure hold test, compliant to US EPA standards and methods.

The integrated compressor pressurizes the filtrate side of the unit with compressed air at a adjustable pressure of approx. 1,55 bar (21,75 psi). During this test the inlet and the filtrate valve are closed and the drain of the system is opened to atmospheric pressure.

Important:

It is essential that during a direct integrity test no pressure head is present at neither one of the ports of the unit. Please make sure that the unit can turn the feed- and BW-pressure off if required. Back-pressure on the drain line has to be added to increase the test pressure (10 m = 9,81 bar).

Following a settling time, the pressure decay in the system is now measured through the pressure sensor on the filtrate side. If the pressure drops below a permissible threshold within a defined time period ("Upper Control Limit" for pressure decay), this then indicates membrane damages in the module. If the pressure remains above this particular threshold, then the filter still achieves a >99,99% removal for bacteria and parasites (>4 log)

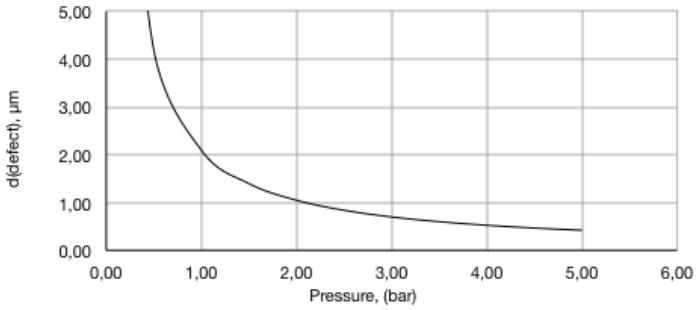
Note:

Individual membrane damages do not indicate a total failure of the removal performance, however, we recommend contacting your authorized service partner or manufacturer immediately.

2) Resolution of the integrity test

The Virex Pro system has undergone 3rd party monitored challenge testing to US EPA standards (US EPA Filtration Guidance Manual), has proven full removal of all pathogens and was granted a >4.7 log removal for virus, bacteria and parasites.

With its default settings, the system has proven to be able to detect membrane damages as small as 1.39 µm with its integrated Membrane Integrity Test.



Picture 12: Relation between test pressure (ptest) and detectable defect-size (dfect)

Important:

All technical systems can fail, even if very unlikely, from time to time. We therefor recommend to combine every health related device, as e.g. this Ultrafiltration System, with a second redundancy barrier system (e.g. chlorination or UV disinfection).

3) Removal Values and Test Sensitivity

The Direct Integrity Test (DIT) of a Virex Pro unit is typically done at a test pressure p_{test} of 1,55 bar (22.48 psi) on the filtrate side of the unit against atmospheric pressure in the drain-line of the unit. The higher the applied test-pressure, the higher the resolution of the test, as can be seen in previous paragraphs.

Important!

Back-pressure on the drain-line during a DIT has to be added to p_{test} !

In case the drain line's atmospheric outlet is above the unit's upper edge, the resulting permanent back-pressure has to be overcome by the integrity test pressure p_{test} and therefore p_{test} has to be increased by the back-pressure. This is done by adding the vertical difference between the outlet and the upper edge of the unit as follows: e.g. the outlet and the upper edge of the unit show a vertical difference of 2 m → $p_{test(neu)}$=$ptest_{(1,55\ bar)}$ + 2 m / (9,81 kg x m / s2) = 1,75 bar.

The pressure decay occurring during a DIT consists of pressure decay due to diffusion of pressurized air in water and through the membrane, as well as potential pressure decay caused by a defect:

- The pressure decay caused by diffusion is specific to each membrane module and is entered into the software from the modules Quality Control Passport. By default, the software contains upper limit settings for the modules QC release values.
- The pressure decay over time, caused by a membrane defect, identifies the size of a defect. During filtration, water potentially contaminated with pathogens could reach through the defect to the filtrate side untreated, and there blend with filtered water. The size of the defect as well as the differential pressure during filtration determine how much water flows through the defect. The ratio of contaminated flow through a defect to the design flow of filtered water then again determines the dilution ratio. If the contaminated water does not account for more than 0,01% of the total design-flow, a total rejection for pathogens of 99,99% is still granted, the unit is allowed to continue production.

Design-flow (Q_p)	**Upper Control Limit for pressure decay during test**	**Resulting Log Removal Value LRV (DIT)**
27 l/min	<9,3 mbar/min	>99,99% (4 log)
20 l/min	<7,0 mbar/min	>99,99% (4 log)
13 l/min	<4,6 mbar/min	>99,99% (4 log)

Upper Control Limits UCL for pressure day during DIT, in relation to design-flow Qp

4) Test Frequency

The Direct Integrity Test (DIT) is done fully automatically and does not require operator's attention. The results of the tests are stored in the unit's integrated data-logger. The frequency at which the tests are carried out can be set in the control: The DIT is carried out

- every 24h at an adjustable time-of-day
- after a turbidity spike in the filtrate of the system has exceeded an adjustable Upper Control Limit (standard setting: US EPA, 0.15 NTU) for an adjustable duration of 15 minutes (US EPA requirement).

6.5 Stop mode

If a malfunction or an alarm occurs in the system or maintenance or service work is performed on the system or the control unit, then the system can switch over into the stop mode. The system can also be stopped by manually pressing the stop button. All valves are closed in the stop mode.

6.6 Disinfection of the system (e.g. after standstill)

Depending upon the ambient temperature and the contamination of the raw water with dissolved organic components (DOC), algae and bacteria, bio-growth takes place in the system at no-flow conditions. The number of germs increases exponentially and can lead to increased germ-counts on the pure water side downstream of the system. This contamination on the pure water side of the system are not germs from the raw water (hence potential pathogens), but germs from the line network, which were already present before the installation of the system.

Note:

It must be ensured that a daily rinse of the system (forward flushing followed by backwashing) is carried out. This measure serves the purpose of minimizing germ-growth in the system. Such stagnation during idling periods can be prevented by putting the unit into a Stand-by Mode rather than into Stop-Mode. The system then carries out a daily flush.

After longer standstill-periods, performing a disinfection of the system at the time of re-commissioning is recommended. For raw water containing DOC, it is recommended to perform such disinfections at regular intervals.

Filter modules, which were already rinsed and taken into operation, can be stored after they have been flushed and subsequently treated with a 0.95% sodium bisulfite solution to avoid biological growth and contamination. Please read page 67 "Storage and preservation of filter modules" for further information.

Note:

After a prolonged standstill-period of the ultrafiltration system, it must be rinsed in the same manner as for an initial commissioning.

7. Control Panel on the Unit

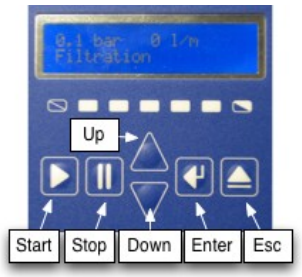
The intelligent control electronics ensure that the filtration always runs optimally. Additionally, the control unit can perform regular integrity tests (pressure stability tests of the membranes). However, should a problem occur, you will be notified by the control unit (alarms). Additionally, we offer you the possibility to forward error messages directly to your cellular phone via a text message.

7.1 Control panel of the control unit

The display has two lines. During filtration, the top line presents status information on the current pressure difference Δp between the inlet and filtrate side of the membrane module (pressure difference across the system!) and the current volume flow. The bottom line displays the current operation mode.

The user can navigate through the respective menu through the arrow keys (up and down). Selection of a menu item is acknowledged by pressing the enter key.

By pressing the escape key, the user exits the selected menu item and returns to the next highest level. If the escape key is pressed at the highest menu level, the user exits the menu and the current operation mode is displayed.



Picture 13: Control Panel of the Seccua UF unit

Note:

The menu has an automatic time-out feature after which it closes and the current operation mode is displayed again. The duration of this time-out can be set individually and can be changed at all time via the PC software.

7.2 Menu structure of the control unit

Main menu item	Sub menu item	Description
Cleaning	-	Manual start of a non-chemically enhanced cleaning cycle
Integrity test	-	Manual start of the integrity test
Manual switching (self test)	-	Manual switching of the digital outputs
	Valve 1 opened	Feed valve V1
	Valve 1 closed	
	Valve 2 opened	Drain valve V2
	Valve 2 closed	
	Valve 3 opened	Feed valve V3
	Valve 3 closed	
	Valve 4 opened	Drain valve V4
	Valve 4 closed	
	Valve 5 opened	Filtrate valve V5
	Valve 5 closed	
	Valve 6 opened	Vacant / not assigned
	Valve 6 closed	
	Pump 1 on	Feed pump
	Pump 1 off	
	Pump 2 on	Dosing pump inlet (dosing pump 1)
	Pump 2 off	
	Pump 3 on	Backwash pump
	Pump 3 off	
	Pump 4 on	Dosing pump backwashing (dosing pump 2)
	Pump 4 off	
	Compressor on	Compressor for integrity test / pressure stability test
	Compressor off	
Error		Display error log and confirm / acknowledge error.
DIT Error		Shows whether the last performed DIT was successful.
New Filter		This function reads the permeability of a new filter after it has been exchanged onto the system. The reading is performed once the flow through the unit has reached a minimum, required for exact calculations.
Q/dp reset		Resets the permeability of the filters to factory settings.
UF Unit No.		Displays the ID with which the system identifies itself on a CAN-Bus. The ID can be changed in this menu.
Standby		Set the system into Standby-mode, in which the system does not filter, but performs a regular flush of the system.
Info		Display the firmware version of the control unit.
Chem Cleaning (Chemically Enhanced Backwash)		Starts a chemically enhanced cleaning cycle, if the required equipment is installed.

7.3 Operation

1) Stopping the system

It is possible to switch into the stop mode from any operation mode by pressing the stop button. Filtration can be restarted by

pressing the start button from the stop mode.

Note:
It also possible to switch into the stop mode during startup of the system by pressing the stop button.

2) Alarm display, error codes

Note:
All occurring alarms are logged with their code, date and time.

If there are alarms in the alarm log that are new and have not been acknowledged by the operator yet, **"ERR"** is displayed at the bottom right of the display. If an alarm occurs, the filtration will run for the set number of days (see parameter "Max. number of days filtration after alarm before stop")and at the end of this period will switch into the stop mode.

After resolving the source of the error, the alarm message on the controller must be acknowledged:

1. Select the menu item **"Error"** on the controller and enter into the alarm log.
2. Navigate through the alarm log using the arrow keys. Alarms that are new (to be acknowledged) have **"new"** marked behind them. Alarms, which have already been acknowledged are marked with **"(OK)"**.
3. Acknowledgement of an alarm is done by pressing the enter key when the respective alarm is shown.

Error code	**Description**	**Reaction**			
		Stop (immediately)	Stop (after X days)	Standby mode	Notification: - Open cold contact - Turn on external alert - Send SMS - Alert on CAN Bus
EXT	Contacts between X5.6 and X5.8 are bridged by an external cold contact. A peripheral device is signaling an alert. Different levels of reaction can be set.	(X)		(X)	X
FI07	Too high Trans-Membrane-Pressure during filtration. The pressure between feed- and filtrate-side of the unit exceeds Δp >2.5 bar (36.3 psi).	X			X
FI08	The fouling level of the membrane has exceeded the set threshold which triggers a cleaning cycle, before passing the min. filtration duration.		X		X
FI09	Feed tank level too low to perform cleaning cycle.				X
IT02	Upper control limit exceeded. Integrity test failed.	X			X
BW07	Too high Trans-Membrane-Pressure during backwash. The pressure between filtrate- and feed-side of the unit exceeds Δp >2.5 bar (36.3 psi).	X			X
TEST	Test SMS from PC client.				

3) Manual start of a cleaning-cycle

The cleaning starts automatically when the conditions set via the filtration parameters are met (page 27 ff.) . If the cleaning should be explicitly started manually, the menu item **"Cleaning"** must be selected.

4) Manual start of a Direct Membrane Integrity Test

The membrane test (integrity test) starts automatically in the set interval. If the membrane test should be explicitly started manually, the menu item **"Mem.test"** must be selected.

8. Programming and PC-Software

8.1 Requirements

The versions of the PC software and the firmware must be compatible with each other. Before installing a new version of the PC software or the firmware, please enquire with your customer service (see page 8) whether your software versions are compatible.

The software is at the time being only fully tested for 32bit operating systems. For 64bit we can not guarantee the full functionality. We apologize for that and strife to have a 64bit version in the future.

8.2 PC software

1) Installation

Important!

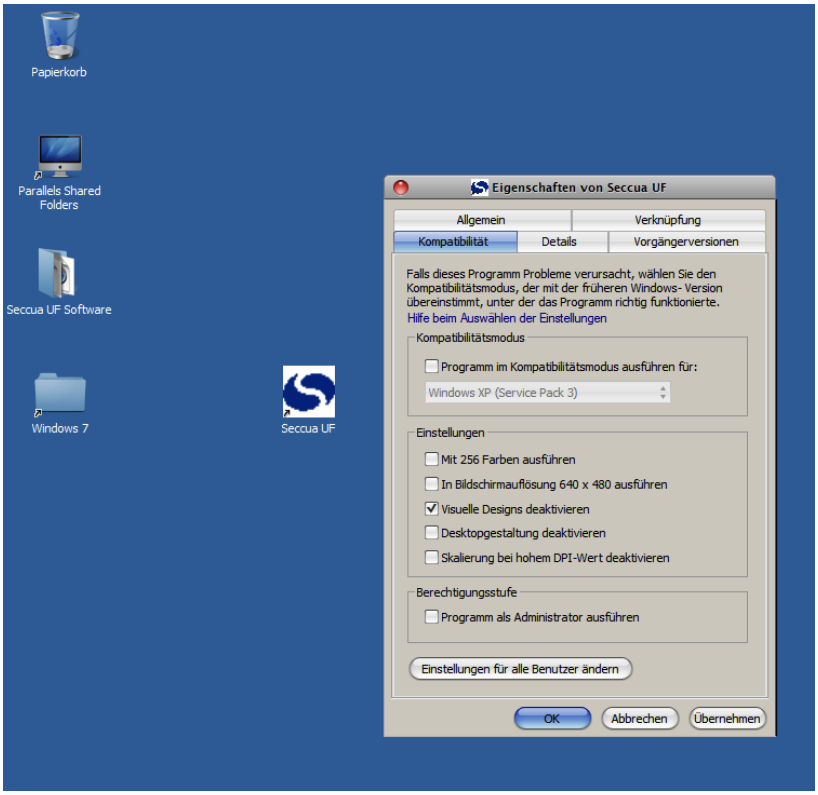
If you have an older software version already installed make sure to either remove it completely before you install the new software or install the new software in a different folder. Rename the icons according to the different versions then to prevent confusion.

Note:

System requirements: Windows 2000, XP, Vista (32bit) or Windows 7 (32bit). Administrator rights are required in order to install the PC software.

Procedure:

- Do not connect your PC with the control unit via USB yet.
- Start the PC installation program "Seccua_UF_Setup" and follow the instructions provided.
- After successful of the software, the link “Seccua UF” will appear on your desktop.
- Under Windows 7, now the “visual designs” have to be de-activated for the Seccua program: Click right on the program link, select “Properties”.



Picture 14: Windows 7 requires the de-activation of "visual designs" for the Seccua application

- Choose “Compatibility” and select “de-activate visual designs”.

- Confirm with “OK”.

2) Setting up the connection to the control unit

The PC software can be run both offline (without a connection to the control unit) or online.

There are several way of connecting the PC software with the control unit:

1. USB: In this instance a direct connection with the computer is created with the USB connection of the control unit.
2. Internet: If the control unit is equipped with a modem and the PC has an Internet connection, then the access to the con - trol unit can also be performed via the Internet.
3. Through a CAN-Bus connection, if the unit is hooked up to a CAN Bus.

Important:

Please follow the steps described in the following section in order to establish a connection with the system via the Internet. It is important that you perform the basic configuration at the system via a direct USB connection.

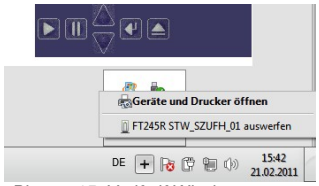
a) Selection of the connection type

In order to set the way of communication between your PC and the Seccua Control, pls proceed as follows:

1. Open then menu “Communication” → “Connection Wizard”.
2. Choose the required communication path.

USB

1. Make sure, that your PC is connected to the control via a USB-cable and that Windows recognized the control. In case you cannot connect, make sure by checking in the USB Manager on the lower right hand side of your Windows desktop: If the USB Driver “FT245R STW_SZUFH_01” is shown, Windows has successfully linked to the control.



Picture 15: Verify if Windows recog- nized the USB port of the control

2. Select the Menu “Communication” → “Connection Assistant”, then select “USB-Cable” and click “Continue”.
3. In the following window, advanced USB parameters can be edited, which is typically not required, unless several con- trols are connected to one PC via CAN-Bus. Therefor, click “Continue”.
4. Now please enter the ID of the system you want to connect to. By default, the ID of the Seccua systems is set to 0 (zero), unless you change the ID on the controller directly. In case the units are connected to a CAN-Bus every unit has a different ID. Verify the ID and click “Continue”
5. The software now shows a summary of the parameters set during the previous steps. Verify and click “Complete” if o.k.
6. The PC Software nows connects to your system.

CAN-Bus

1. Make sure, that your PC is connected to the CAN-Bus via a CAN-Bus to USB-dongle and that Windows recognized the control. In case you cannot connect, make sure by checking in the USB Manager on the lower right hand side of your Windows desktop: If the USB Driver “FT245R STW_SZUFH_01” is shown, Windows has successfully linked to the con- trol.
2. Open the menu “Communication” and choose “Connection Wizard”
3. Choose “CAN-Bus” and click “continue”.
4. Typically, the advanced settings do not need to be changed and can be confirm by clicking “Continue”.
5. Now choose, with what kind of control on the CAN-Bus you want to connect. Here it is assumed that a controller of a UF unit on the Bus will be programmed, so pls. choose “UF (Control Pro of a Virex or Phoenix Unit” and click “Continue”

Important!

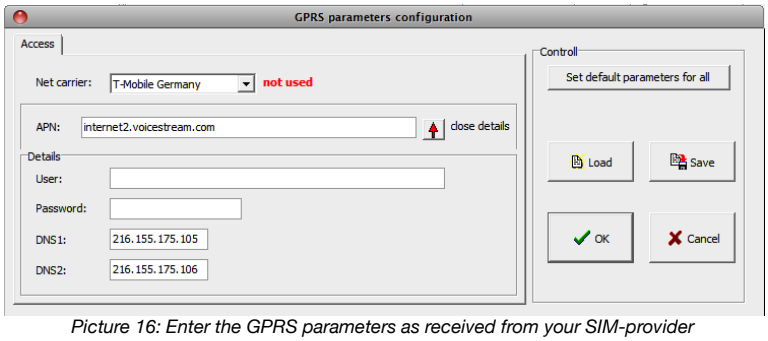
The system now scans the CAN-Bus for available controls. Choose the control you want to connect to and click “Continue”. The ID of each controller needs to be unique on the entire CAN-Bus. Please make sure you set the IDs properly in the UF systems menu.

6. The software now shows a summary of the parameters set during the previous steps. Verify and click “Complete” if o.k.

7. The PC Software nows connects to your system.

Configuring an internal modem

1. Insert a SIM-Card into the internal modem-module. The SIM-card needs to be a GPRS-compatible card and must contain a data-flatrate in order to allow regular and frequent data connections to the unit.
2. Start the PC Software and connect to the unit via USB, as described above.
3. Open the menu “Communication”, then select “Internal Modem (UF-control)”, “Configure GPRS parameters.



Picture 16: Enter the GPRS parameters as received from your SIM-provider

4. Click “Load “ to load the configuration-file for your provider, which can be obtained from Seccua (.GCF-file) or enter the parameters for accessing the internet through GPRS, as received by the provider of your SIM-card.
5. Confirm the settings with “OK”.
6. Open the menu “Communication”, then “Internal Modem (UF Control)” and choose “Configure GSM Pin”.
7. Enter the PIN number as provided by your cell-phone provider. If you didn't receive a PIN, enter “0000”. Confirm with “OK”.
8. Open the menu “Communication”, then “Internal Modem (UF Control)” and choose “Configure TCP Communication Parameters ...”
9. Enter your Group ID and Client ID and the following values:

   IP Address of server to be connected: s15383353.onlinehome-server.info

   Port number of server to be connected: 30000
10. Acknowledge with “OK”
11. Restart the controller by disconnecting and re-connecting its power supply.

Important!

Make sure you enter the PIN number of your SIM-card properly. If the control is restarted more than 3 times with the wrong PIN number entered into the modem, the SIM card will block itself. It then has to be mounted into a cell-phone and unlocked using the PUK keys as provided by the SIM-card provider.

Checking signal strength

1. Connect to your UF unit as described above.
2. Choose “Communication” → “Internal Modem (UF Control”, then “Get signal quality”.
3. The signal strength shown needs to be at least at -81 dB or greater in order to be able to establish an internet connection.
4. If required, Seccua offers special antennas offering better reception quality.

Important!

After installing the modem, please verify the signal strength at site. The GPRS network at site must be stronger than -81 dB.

Internet through modem

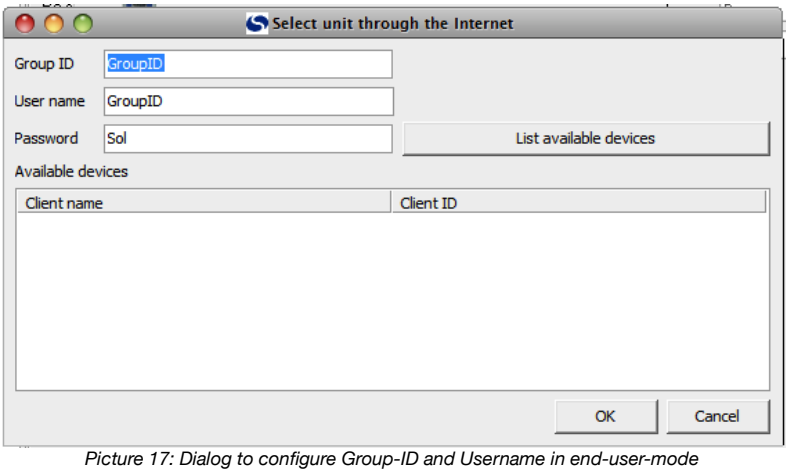
Once the GPRS modem is mounted and configured properly, the unit can be accessed over the internet.

Before installing the unit, please make sure to receive the following parameters from your Seccua hotline (e.g. under support@seccua.com or your regional Seccua Partner).

Parameter:	Description	My Information (please note)
Group ID:	Group-ID, under which your system occurs in the directory on the server.	
User name:	Name of the user, which is part of a Group-ID. Several users can be contained in one Group-ID.	
Password:	Password for each user name	

Connect to the unit over the Internet as follows:

1. Make sure your computer is connected to the internet.
2. Open the Seccua UF software and select the menu “Communication”, then choose the “Connection Wizard”
3. Choose “Internet (TCP over GPRS)” and click “Continue”
4. Choose “Advanced Configuration of communication mode”
5. In the windows, which now appears, enter your Group-ID, Username and Password. If you're in System Engineer's mode, you will see a different dialog than in end-user's mode. In both dialog, typically only those three parameters need to be changed.



Picture 17: Dialog to configure Group-ID and Username in end-user-mode

6. Click on “List available devices” to show the systems available under the ID you have entered.
7. Select the system you would like to connect to and click “OK”.
8. Confirm your settings a second time by clicking “Continue” in the next dialog.

The connection is established. Depending on the GPRS signal strength at your location this can take up to 30 seconds. After a successful connection you can check the state of the unit by clicking “Reload” in the “Operating mode” window.

b) Troubleshooting connection errors

At the lower edge of the main windows of the Seccua Software, the actual connection states is displayed (“Connected to UF #” or “Disconnected”)

Picture 18: Status of the connection between th software and the unit, as shown at the lower edge of the program windows

Once configured, the connection can be established and terminated using the commands “Start connection” or “Terminate connection” in the menu “Communication”.

If errors are encountered while establishing a connection, the following reasons may apply:

Error message **"Project does not match"**

The version of the PC software does not match to the version of the firmware. Ensure that you are using a compatible version of the PC software and firmware. For this purpose, either install a different version of the PC software or flash a different version of the firmware (see page 65).

Note:

In order to retrieve the version of the firmware, click the "down" key in the control until the menu text "About" appears in the dis - play. Then click the "return" key and the control unit will display the current version of your firmware. The firmware-version is also shown in the PC software after an error occurred when trying to connect with an incompatible version of PC software.

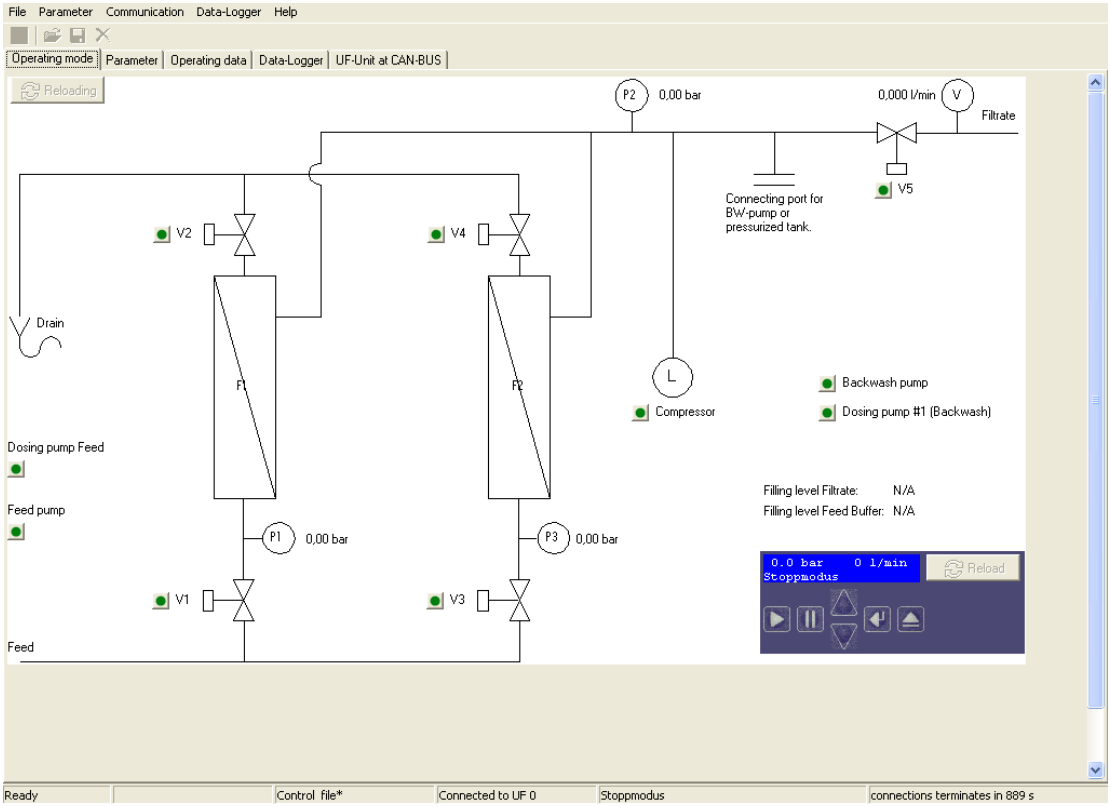
Change of Connection mode by selection of a different driver:

After changing the connection mode by selecting a different driver the software has to be closed and restarted to make the make the connection.

8.3 Operating status display of the software

1) Display

When opening the software, the following screen appears:



Picture 19: The operation status display of the control software

If the user is connected with the control unit (online), the tab "Operation Mode" will display the following data:

2) Sensors displayed:

- the current pressure in the feed-line (P1) and the filtrate-line (P2),
- the current flow
- the level of a feed- or filtrate tank (if connected)

3) Actuators displayed:

- Valves (Feed-, Drain-, Filtrate)

Important!

Valve switches in the “Operating Mode” screen are displayed light green, when open related to flow direction during filtration-mode. This signal does not mean that valves are powered. Seccua uses slow closing, pilot assisted solenoid valves which change their characteristics (e.g. from “normally open” to “normally closed”) with a change in flow direction!

- Feed pump and backwash pump
- dosing pumps
- compressor

If the system is in stop mode, then the valves, pumps and the compressor can be manually opened and closed or turned on and off through the switches.

Note:

In the right lower corner of the display "Operating Status" an image of the display of the control unit as well as its keys is located. This displayed keys can be operated via the mouse in order to operate the control unit on site, e.g. in order to switch from filtration into the stop mode.

8.4 Setting the parameters in the software

1) Programming levels

The Seccua PC Software allows two different levels of access:

1. In the “End-User” level, the user of the software is able to reach all functions required for setting and optimizing operating parameters of the unit.
2. The “System Engineer's” level allows access to all parameters required to set-up the hardware and bus-system of the system. This mode is protected by a password.

Important!

Not all menu options displayed in the following manual can be accessed or are visible in the end-user mode.

2) Saving the settings in the control unit

Important!

The system has to be in stop mode to successfully save changed parameters. This is for safety reasons.

Settings, which are performed in the software, are only applied after the data have been saved in the control unit. For this, the menu item "Save to Control" must be selected in the menu "Parameter". Alternatively the chip icon under the menu item "File" can be used.

Important!

In many cases additional setting options and menus become accessible only after saving the performed changes.

For instance the submenu for the configuration of the inlet pump will only appear after the item "Feed-Pump installed" has been selected on the page "Parameters/Filtration" and the change has been saved in the control unit.

3) Saving the settings to file

All set parameters can be saved in a file. In this manner, for instance system-specific parameter sets or backup copies can be created of known working settings during testing.

There are two options available:

a) Saving the complete parameter set in files:

1. In order to save all parameters of all forms to separate files, which can later be re-loaded into the control, select the menu "Parameters" and then "Save all sets of parameters to file".
2. Once selected, the system will ask to specify a directory where to save the separate files (one file for every tab) to.
3. The program will then create a file for each individual form whereby the files will all receive the same name, however will be followed by a different extension:

Filtration	.FIL
Inlet pump	.FPP
Cleaning	.CLE
Backwashing	.BAW
Chemical dosing	.CBW
Membrane test	.MET

Alert	.ALA
Global	.GLO
Status name (only developer mode)	.STN
Other texts (only developer mode)	.OTS
Main menu items (only developer mode)	.MMI
Self-test menu items (only developer mode)	.SMI

b) Saving the currently edited parameter set in a file:

In order to save the parameters of the currently edited form, select the menu "Parameters" and then "Save actual set of parameter to file".

The program will generate a file with the respective extension (see list shown above). You can save this at any location on your computer or network.

4) Loading the saved settings from a file

Saved parameter sets (see above) can be easily read back into the software. To do this, either use the function

1. "Load all sets of parameters from Files to UF-Control"
   Navigate to the location that contains the previously saved files in the dialog that appears after selection of this menu item and select the correct file. The program will then load all applicable files into the software.
2. "Load actual set of parameter into UF-Control"
   Navigate to the location that contains the previously saved files in the dialog that appears after selection of this menu item and select the correct file. The program will then load the applicable file into the software.

Important:
These settings will only become active after the loaded data has been saved in the control unit.

5) Setting time and date

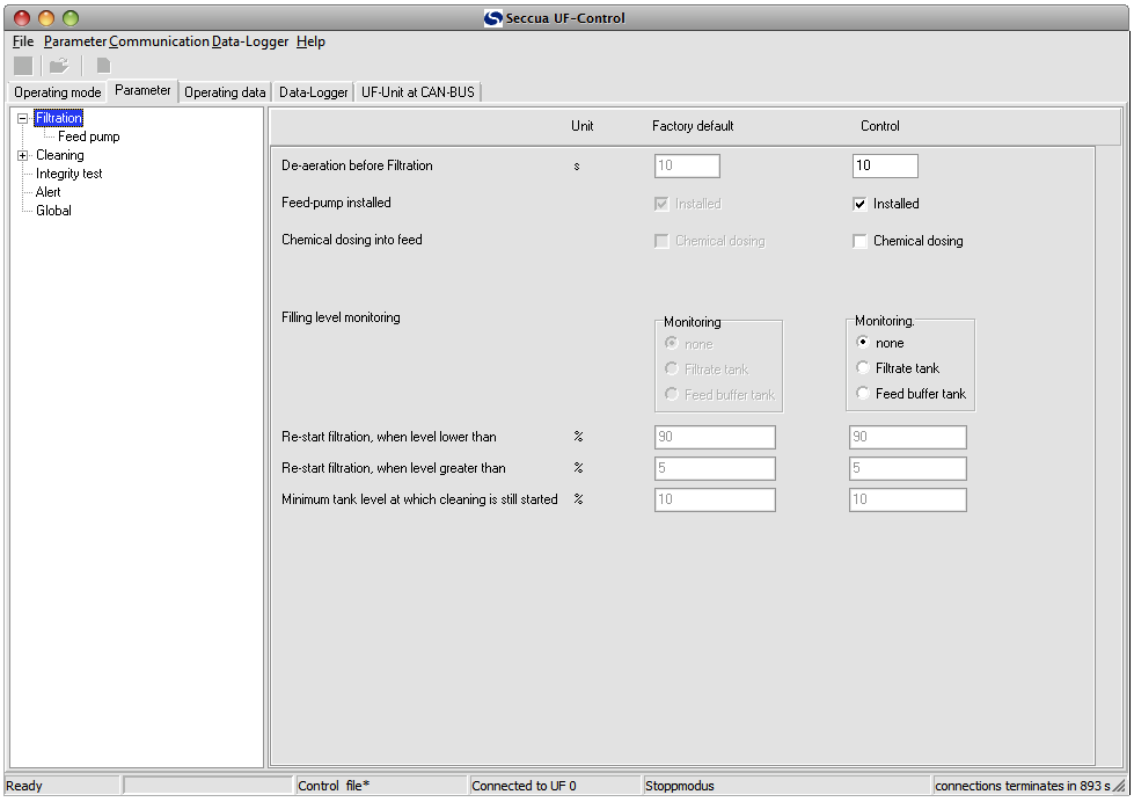
The control unit is equipped with a real time clock. The date and time is logged together with the other data in the data logger during a change of the operation status, e.g. from filtration to cleaning. Therefore it is important that both the data as well as the time have set correctly.

Check the settings in the menu "Communication" in the menu item "Set clock". During setting you have the possibility of using the time data of your computer.

6) Setting filtration

The possible settings are described below.

a) *Filtration parameters*



Picture 20: Form for setting the filtration parameters

Parameters	Description
De-aeration before filtration (s)	Water flows from the inlet through the system in to the drain during de-aeration. The filtrate valve is closed during this procedure. This step should continue until all air trapped in the system if flushed out.
Feed-pump installed	Select if in filtration mode a feed pump has to be switched or controlled. If this option is selected further parameters for configuring the feed pump become available after saving the settings to the control.
Chemical dosing into feed	Check this box to turn on dosing pump #2 (DO6) during filtration, e.g. in order to dose flocculant into a constant flow. Nevertheless it is recommended to use the systems output of the volumetric flow signal to control flocculant dosing or residual chlorine dosing. A Connectivity Kit is required for this!
CV value of Filtrate-valve (V5)	This value is not to be changed. It's required for internal calcs.
Filling level monitoring	None: do not monitor tank levels Filtrate tank: monitor a filtrate tank level Feed buffer tank: monitor a feed buffer tank The tank levels are monitored via a 4-20 mA signal, put into the system via the Connectivity Kit.
Re-start filtration, when level lower than (%)	Set a filtrate tank level at which the system will resume filtration from stand-by mode.
Re-start filtration, when level greater than (%)	Set a feed buffer tank level at which the system will resume filtration from stand-by mode.
Minimum tank level at which cleaning is still started (%)	Set a tank level below which the system will not start a cleaning cycle. This prevents the system to run out of water during a cleaning cycle, in case of water shortage.
Sensor signal to be interpreted as empty (mA)	Determines, at which mA-input from the level sensor the software interprets the tank to be empty.

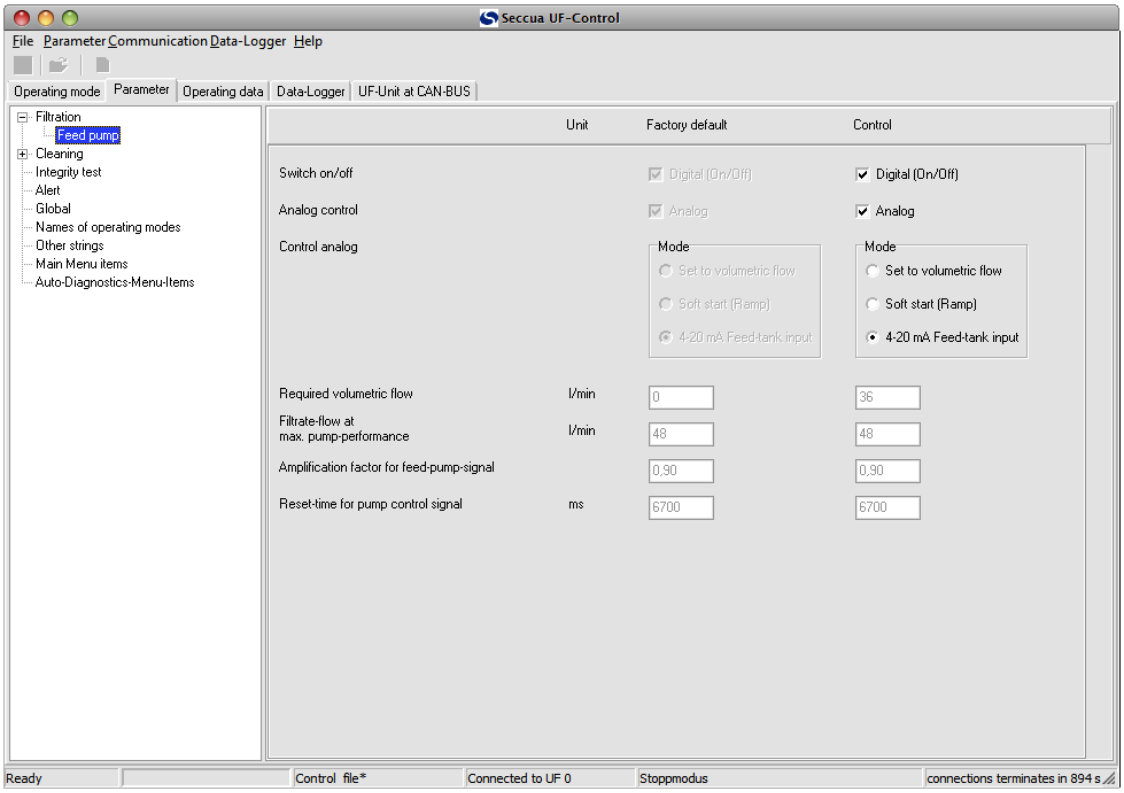
b) Configuration of an inlet pump

Connect the inlet pump in accordance with the description in chapter " Connecting pumps and cleaning equipment“ (page 21).

Activate the inlet pump in the form "Filtration" (see section a) Filtration parameters, page 48). Once the setting of a feed-pump being present is saved into the control, additional parameters will appear for configuration:

Important:

A Connectivity Kit is required in order to connect and control an inlet pump.

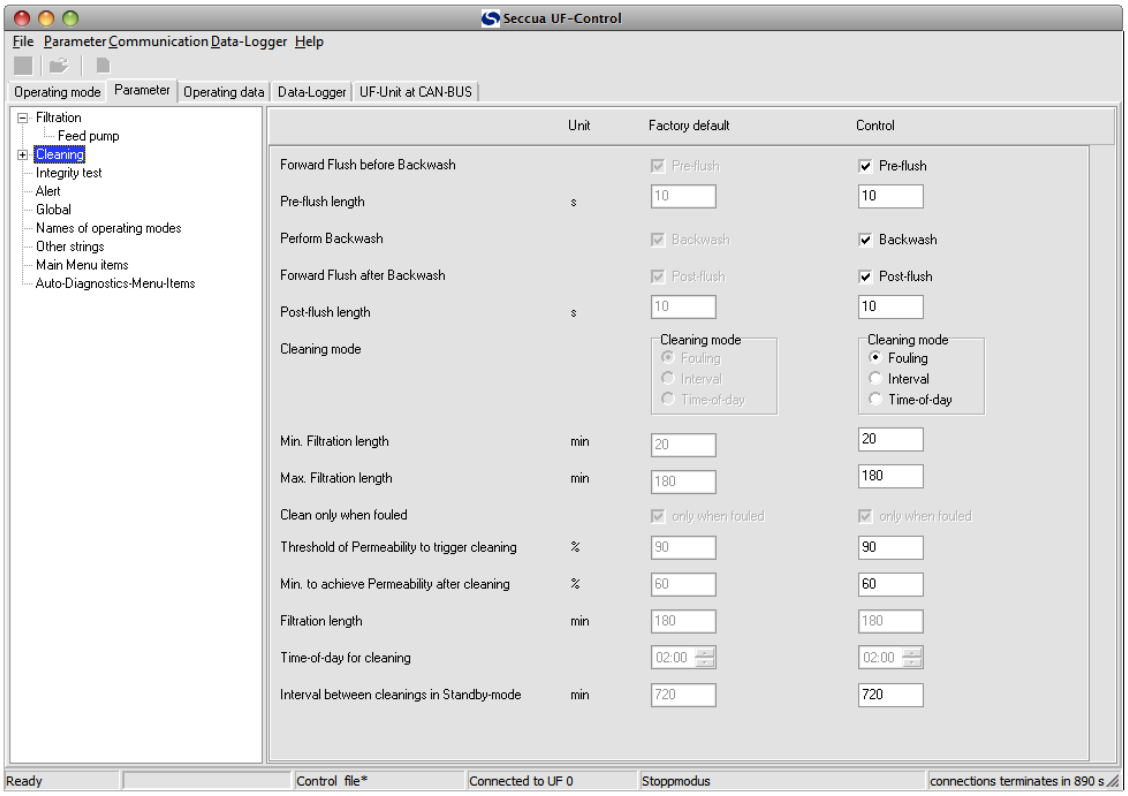


Picture 21: Form to set Feed-pump parameters

Parameters	Description
Switch on/off	If “On” is selected, the pump is controlled during operation by switching the power supply of the pump via the Connectivity Kit.
Analog control	If the field "Analog" is selected, the control unit will transmit a 4-20 mA signal to the pump.
Control analog	• Set to volumetric flow: Controlling of the pump according to a constant volume flow. • Soft start (ramp): Slow start-up of the pump with a signal increasing from 4 to 20 mA • 4-20 mA input signal: The input signal "tank filling level" (see chapter 5.6 paragraph 4 "Connection of the level signal of a feed-buffer or filtrate -tank", page 22) is looped through to the pump VSD during filtration unmodified. During forward flush the signal is increased to 20 mA.
Required volumetric flow (l/min)	Input the required filtrate output of the system. This value has to be below the max. filtrate perform - ance of the system and the pump.
Filtrate-flow at max. pump performance (l/min)	Filtrate volume flow through the system at full output of the pump (controlled with 20 mA). Best to de - termine at new modules and fully turned on pump.
Amplification factor for feed-pump signal	Typically not to be modified.
Reset-time for pump control signal (ms)	Typically not to be modified.
Reset time for pump-control-signal	Typically not to be modified.

7) Cleaning

The possible settings are described below.

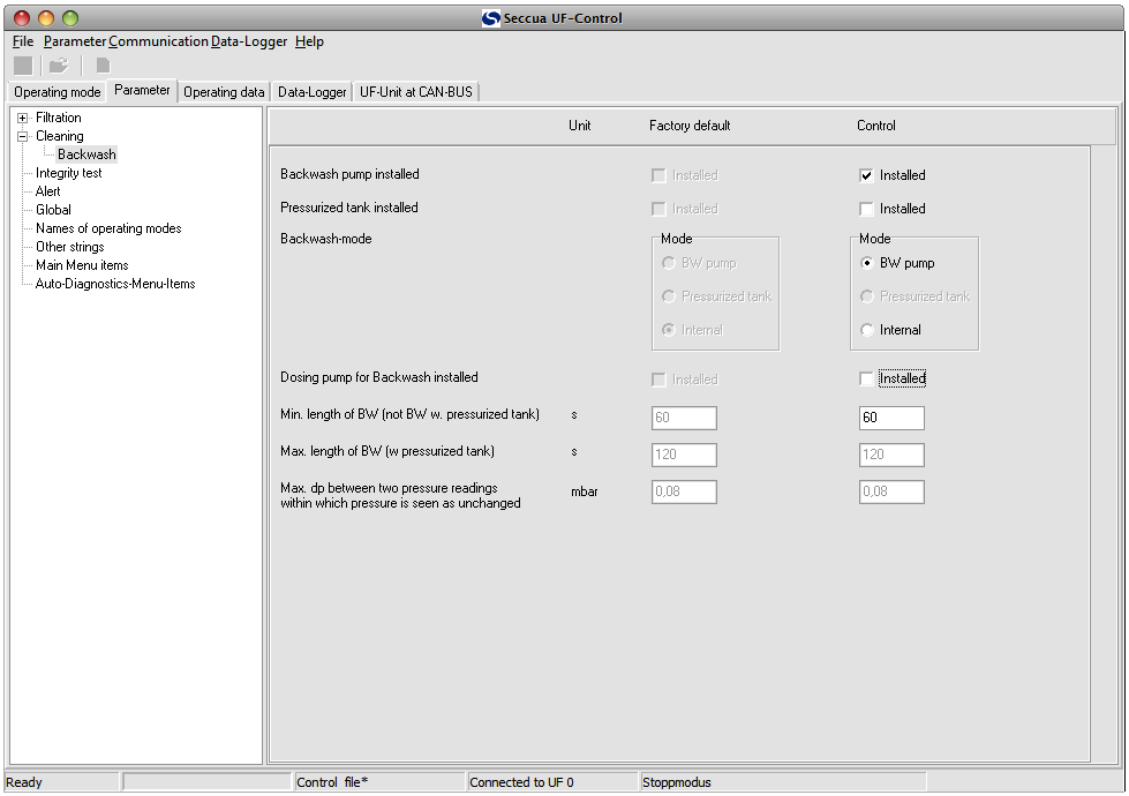


Picture 22: Cleaning parameters

Parameters	Description
Forward Flush before Backwash	Here the forward flush can be defined as a first step of a cleaning sequence.
Pre-flush length (s)	Duration of the Forward Flush before the backwash.
Perform Backwash	A backwash can be activated and deactivated via this parameter.
Forward Flush after Backwash	A Forward Flush after the backwash can be activated and deactivated via this parameter.
Post-flush length (s)	Duration of the Forward Flush after the backwash.
Cleaning mode	1. Fouling (Depending on degree of fouling of the membrane filters): The cleaning is started when a defined threshold for permeability (determined from the pressure difference and the volume flow) is reached. However, not until a minimum filtration duration has passed, which can be set below. 2. Interval: The cleaning is performed at fixed time intervals. In combination with the parameter "Clean only when fouled" (see below) cleaning will only be triggered at intervals AND if a defined fouling threshold is reached. However, not until a minimum filtration duration has passed, which can be set below. 3. Time: Flushing is performed at a specific time. In combination with the parameter "Clean only when fouled" (see below) cleaning will only be triggered at this time AND if a defined fouling threshold is reached.
Min. Filtration length (min)	A minimum duration of filtration can be set, during which no cleaning cycle will be started, even if the membranes are fouled below the permeability threshold. Only relevant if cleaning mode is set to “fouling”. If the fouling limit is reached before an error message is put out.
Max. Filtration length (min)	A maximum filtration duration can be set, after which a cleaning will be performed in any case, even if the membranes have not reached the fouling threshold which is set to trigger a cleaning. Only relevant if cleaning mode is set to “fouling”.
Clean only when fouled	This option combines the fouling dependent cleaning with the interval or time triggered cleaning.
Threshold of Permeability to trigger cleaning (%)	If cleaning mode is set to “Fouling”, the degree to which the permeability is allowed to drop to can be set here. Permeability is calculated as a ratio between volumetric flow, differential pressure, membrane surface area of the system and water temperature. It is recommended to allow Permeability decays of no more than 30% or less during a filtration cycle. If permeability drops below this threshold before the set “minimum filtration duration” has passed, the system generates a FI08 error.
Min. to achieve Permeability after cleaning (%)	After a cleaning sequence the system goes back into filtration and measures the permeability. The result is then compared with the value entered here. If the latter could not be achieved, cleaning is determined to not have been successful, the system puts out an error BW08.
Filtration length (min)	Duration of a filtration interval, applies in case the cleaning mode is set to “interval”.
Time-of-day for cleaning	A time-of-day can be set here, at which a cleaning shall be performed.
Interval between cleanings in Stand-by-mode (min)	Once the system is put into Standby-Mode, it performs cleaning in intervals as defined herein.

a) Backwash during cleaning

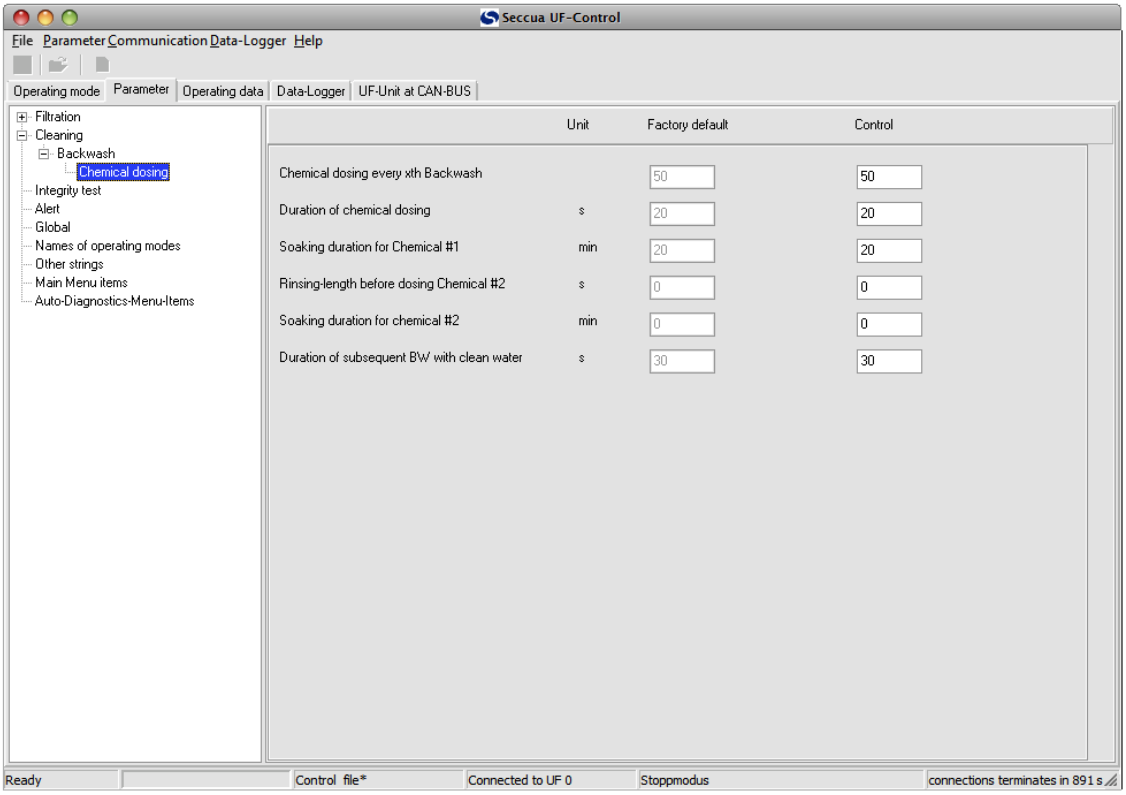
If the menu item "Backwash" is selected and this setting is saved in the control unit, then the submenu "Backwash" appears, in which the following settings can be performed:



Picture 23: Menu "Backwash"

Parameters	**Description**
Backwash pump installed	If this item is selected and the power supply of the backwash pump is connected through the Connectivity Kit of the system (see chapter 5.6 paragraph 10) "Connection of a switched backwash pump", page 23), then the control unit will automatically connect the backwash pump during backwash.
Pressurized tank installed	Alternatively to the backwash pump, backwash can be performed through a pressurized tank or line, which presses previously filtered water through the membrane filter. If a system is installed using this option, then a normally closed solenoid valve needs to be installed upstream the system's backwash port and it will need to be controlled by the backwash pump connectors.
Backwash mode	By pump: backwashing is performed via the pump. This is only available if a backwash pump is installed (see above) and if this setting has already been saved in the control unit. Pressurized tank: Backwash through a membrane receptacle on the filtrate side of the system. Internal: In this case, during backwash one module filters the water, which is used for the backwashing of the second module (not Phoenix 4).
Dosing pump for Backwash installed	If this option is selected and saved in the control unit, a submenu for the configuration of the chemical dosing during backwash (see below) appears.
Minimum length of BW (not BW w. pressurized tank) (s)	The time entered here determines the length of the backwash during backwash through pumps or mutual backwash.
Max. length of BW (w pressurized tank) (s)	The maximum backwash duration determines the length of the backwash when using a pressurized tank for backwashing. The entered time indicates how long the pressurized tank requires for unloading.
Max. dp between two pressure readings within which pressure is seen as unchanged (mbar)	Does not need to be changed.

b) Chemical dosing during backwash



Picture 24: Setting the chemical dosing during cleaning

During chemical dosing during backwash, both dosing pumps that the system can control via the Connectivity Kit, can be used in order to for instance introduce a cleaning chemical in the system in the first step and introduce a second cleaning and neutralization chemical in the course of the second step.

Note:

In order to utilize both dosing pumps for backwashing, the menu item "Use of digital output D06" must be set to "Actual D06 dosing pump inlet" in the form "Global"

Step	BW Chem 1	Soaking #1	BW clean water	BW Chem 2	Soaking #2	BW clean water
Duration	Duration dosing	Soaking #1	Rinsing b. #2	Duration dosing	Soaking #2	Duration subs.
BW Pump	On	Off	On	On	Off	On
Dosing 1	On	Off				
Dosing 2	Off			On	Off	

The backwash pumps are then controlled after each other accordingly, in each instance in regard to dosing duration, time for acting and rinse duration, whereby the dosing duration for both chemicals is seen to be equal (only a single setting value).

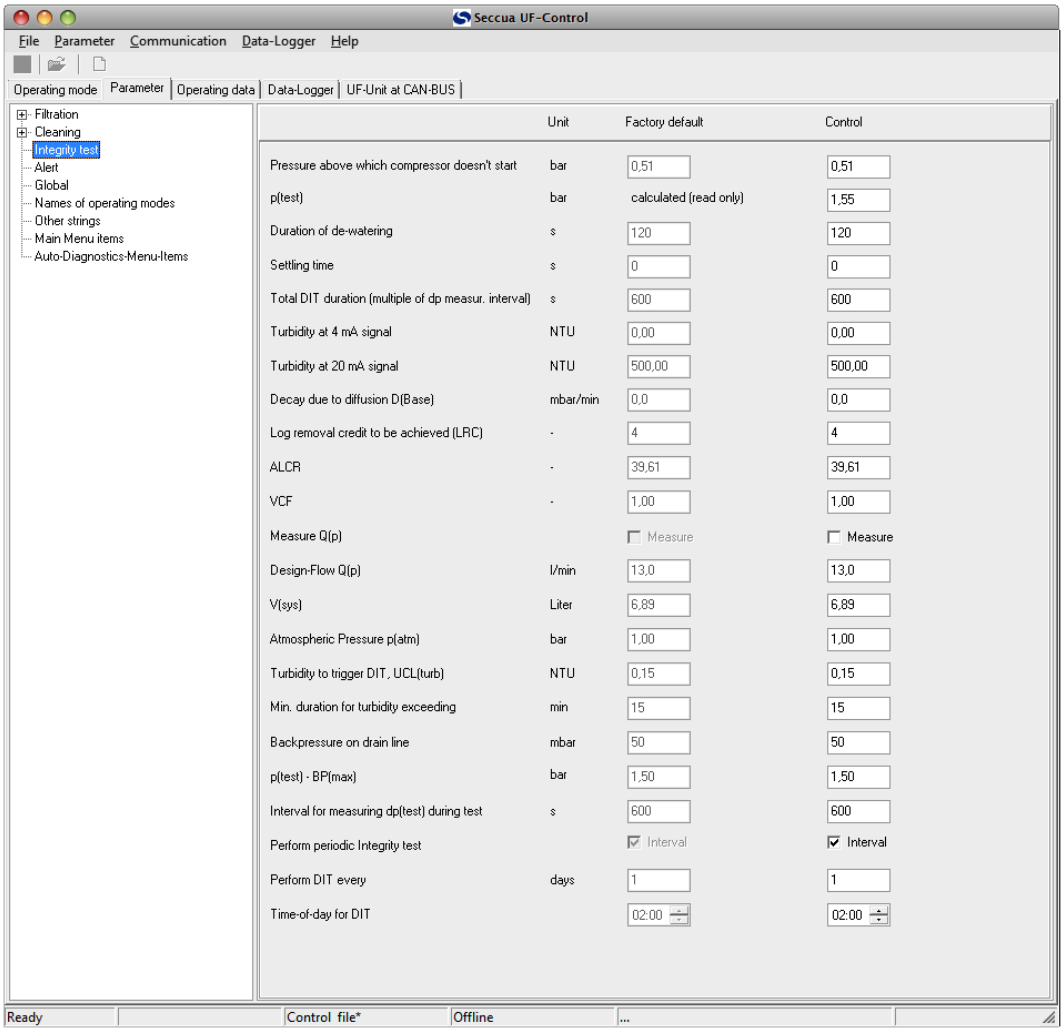
If the user now wants to dose the chemicals in proportion to each other, in order to neutralize in the container downstream of the system, the corresponding dosing proportion is set through the dosing amount of the dosing pumps, generally this is performed by setting the lifting height of the pumps.

Example: NaOH (50%) is dosed for backwashing and is to be neutralized with HCl (31%). through an experiment it is ascertained that the dosing pump of the sodium hydroxide solution, with a dosing duration of 20 seconds and at a lifting height of the dosing pumps of 100%, increases the pH level of the water in the system as desired to a level of pH 13. Therefore the user sets the dosing pump for HCl to a lifting height of 62% and sets the dosing duration to the same length as that used for the sodium hydroxide solution. If both chemicals reach the container downstream of the system following rinsing cycles 1 and 2, then these two chemicals should neutralize each other (a check must be performed!).

Parameters	Description
Chemical dosing every xth Backwash	A chemical dosing is performed at each x-th backwash.
Duration of chemical dosing	Duration of dosing, both for dosing of chemical #1 and #2 into the BW line, while the BW pump is on (see sequence above).
Soaking duration for Chemical #1	The soaking time occurs after dosing of the first chemical by the dosing pump 1. During this time, the valves of the system are all closed.
Rinsing-length before dosing chemical #2	Rinsing is performed by the backwash pump without the use of chemicals after dosing of chemical #1. All chemicals need to be removed from the system during this rinse.
Soaking duration for chemical #2	The soaking time #2 occurs after dosing of the second chemical by the dosing pump 2. During this period, the valves of the system are all closed.
Duration of subsequent BW with clean water	During this step the system is rinsed with pure water (filtrate). Please ensure that all chemicals have been reliably removed from the system during the rinse time after the end of the cycle. Then the system will return to the filtration respectively, if set, will perform a Forward Flush (after rinse).

8) Membrane Integrity Test (DIT)

The system is equipped with a fully automated Direct Integrity Test of the membrane, which complies to US EPA Standards for 4-log removal of bacteria, crypto and giardia (bacteria and parasites).



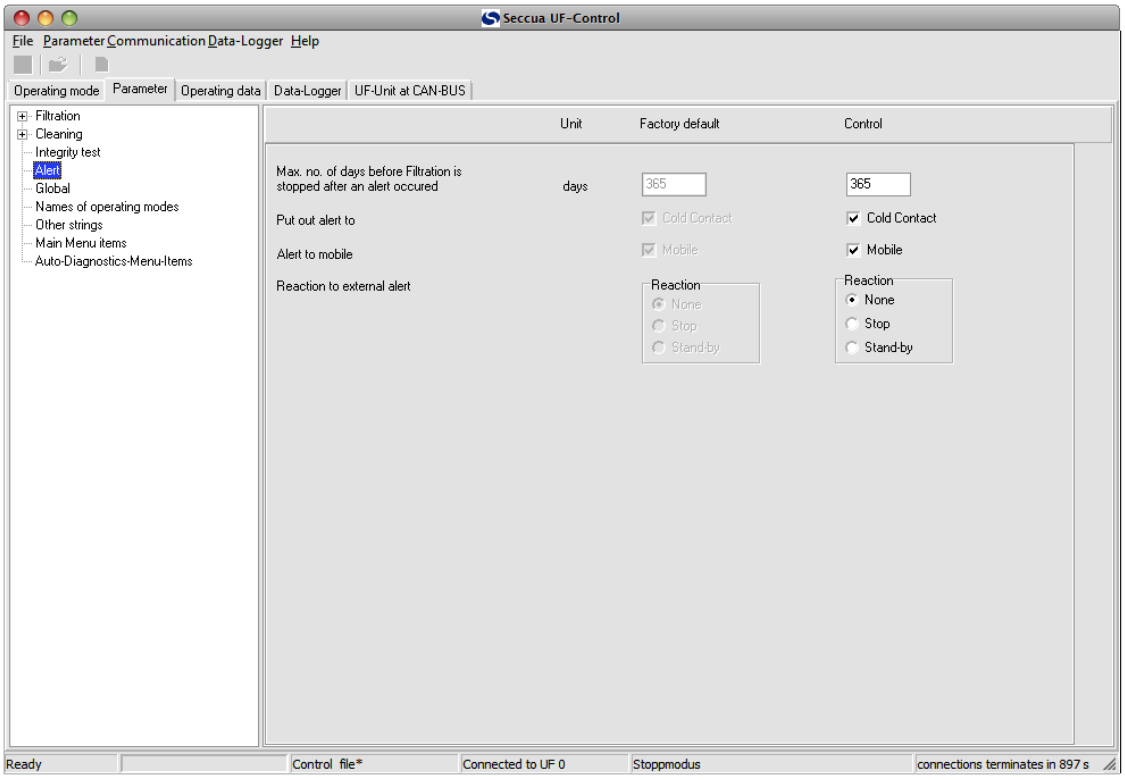
Picture 25: Form to set integrity test parameter

Parameters	Description
Pressure above which compressor doesn't start (bar)	The system monitors the pressure of the system on the filtrate side. If the pressure does not drop below this value (standard 0.5bar/ approx 7psi), the integrity test will not start. Make sure the filtrate side of the system can de-pressurize.
p(test) (bar)	Test pressure, which is calculated from the two values from below: required p(test) according to EPA Guidance Manual (1.5 bar, 21.76 psi) plus back-pressure on drain line. By default, the system itself generates a back-pressure onto the drain line of 0.05 bar (0.72 psi) (Virex) respectively 0.7bar (1.01psi) (Phoenix), so the starting pressure of the DIT will be 1.55 bar (22.48 psi) respectively 1.57bar (22.77psi).
Duration of de-watering (s)	Time the compressor needs to build up the test pressure. If the compressor does not reach test pressure within this time an error is generated.
Settling time (s)	Time between the compressor reaching p(test) and start of measurement of pressure decay. Typically this is set to 0 sec.
Total DIT duration (multiple of dp measur. Interval) (s)	Recommended setting: 23 minutes (input in second: 1380) to be used as duration of a test. The DIT duration has to be a multiple of the value put in in “interval for measuring dp(test) during test”.
Turbidity at 4 mA signal (NTU)	Lower turbidity threshold, linked by the control to the mA-value, delivered by the turbidity-meter as lowest turbidity value reported.
Turbidity at 20 mA signal (NTU)	High turbidity threshold, linked by the control to the mA-value, delivered by the turbidity-meter as highest turbidity value reported.
Decay due to diffusion D(Base) (mbar/min)	Pressure loss due to diffusion of pressurized air in water and through the membrane. Maximum values: D_Base (Virex Pro): 4 mbar/min D_Base (Phoenix 4): 10 mbar/min D_Base (Phoenix 7): 20 mbar/min D_Base (Phoenix 10): 40 mbar/min D_Base (Phoenix 20): 60 mbar/min Please determine the exact values though a DIT performed during Startup of the system.
Log removal credit to be achieved (LRC)	Enter log removal credit, which a DIT needs to verify. US EPA (LT 2) requires 4 (99,99% removal of bacteria and parasites).
ALCR	Virex Pro: ALCR=39.61 Phoenix (all models): ALCR=40.21
VCF	Volume concentration Factor. Not to be changed (EPA Filtration Guidance manual defines VCF=1).
Measure Q(p)	If selected the lowest volumetric flow that occurred in between two integrity tests is used to calculate the removal results LRV. **Recommended!** Do not measure Q(P), but enter a value for Q(P) belowto be used for calculations.
Design-Flow Q(p) (l/min)	Design Flow of the system.
V(sys) (l)	Do not change.
Atmospheric Pressure p(atm) (bar)	By default p(atm)=1.013 bar (14.69 psi)
Turbidity to trigger DIT, UCL(turb) (NTU)	A DIT is triggered, once the turbidity exceeds the value entered here. US EPA requires a DIT to be triggered, if filtrate turbidity exceeds 0.15 NTU for at least 15 min.
Min. duration for turbidity exceeding (min)	After the measured filtrate turbidity has exceeded the UCL(turb) for the duration set herein, a DIT is triggered. EPA requires turbidity to rise above 0.15 NTU for at least 15 minutes to trigger a DIT.
Backpressure on drain line (mbar)	Enter the back-pressure which permanently exists against the drain port of the unit. If the free outlet of the drain is located above the upper edge of the unit, calculate the back-pressure as vertical difference between the free outlet and the upper edge of the unit as follow: BP=(height(outlet)-height(upper edge unit)) *0.0981 bar use height in m (1 ft = 0.305m, 1 in = 0.025m) Default BP in the system: BP=0,05bar (0.72 psi) (Virex) respectively 0.7bar (1.01psi) (Phoenix)
p(test)-BP(max) (bar)	“Real” required test pressure for integrity test, default: 1.5 bar

Parameters	Description
Interval for measuring dp(test) during test (s)	During the DIT, a pressure hold test, the systems measures every period set herein, whether the max. allowable pressure-loss per interval is not exceeded. Typically this is set to 1380 seconds.
Perform periodic Integrity test?	Using this function, the daily integrity test can be turned on or off.
Perform DIT every (days)	Enter the interval, in which an integrity is to be performed (in days).
Time-of-Day for DIT (hh:mm)	Enter the time-of-day, at which a DIT is to be performed.

9) Alert

The possible settings are described below.



Picture 26: Alert parameters

Parameters	Description
Max. no. of days before Filtration is stopped after an alert occurred	After an alarm has occurred, the filtration will carry on for a maximum of specified days before the control unit switches into the stop mode. This parameter does not apply in the case of the alarms DIT_FAILED, BW07 and FI07, as these will lead to an immediate "emergency off" (stop mode) of the system.
Put out alert to	If “cold contact” is marked, the system puts out alerts through its cold contact (X6 Pin 1 and 2) in the Connectivity Kit. The cold contact is open when the system is operating error-free and closes when an alert occurs, until it gets acknowledged at the control unit. Additional the external alert output (X5 Pin 15 and 16) which has 12V in normal operation is switched to 0V if an alert occurs.
Alert to mobile	If checked, the systems sends alert messages to up to 10 mobile phones. Caution: This is only possible in connection with an internal modem. Additionally, you will require a corresponding cellular phone subscription.
Reaction to external alert	Upon an external alert, which is transmitted to the system via a 12 V potential, put out by the Connectivity Kit to a cold contact to be monitored, the following reactions can be triggered: “None”, no reaction is triggered. “Stop”, system enters into stop mode, does not return from stop-mode into filtration if error disappears again. “Stand-by + alert.”, system goes into Stand-by upon an occurring error and comes back if the error disappears again. An alert message is generated that can be sent to a mobile phone. “Stand-by no alert.”, system goes into Stand-by upon an occurring error and comes back if the error disappears again. No alert message is generated. “Message only”: When receiving an external alert, the system puts out an alert that can be sent to a mobile phone.

If the function has been set to "Alert on mobile", then the cellular phone numbers must be entered in the menu "Communication" in "Modem-module", "Edit Phonebook & Alert-SMS" to which the text messages should be sent in the case of an alarm.

10) Basic settings ("Global")

Generally applicable settings for the system are performed in the configuration menu “Global”. Since the menu is too large to be displayed here, no screenshot has been included into this paragraph.

Note:
If the system is operated with a chemical-supported cleaning, then we recommend to set the parameter "Initial status" to "Stop" or "Cleaning". In this setting for instance following a power failure during cleaning, the chemicals remaining in the system will be rinsed out before the filtration is begun.

Parameters	Description
Unit for pressure display	Select “bar” or “psi” to be displayed on the control of the system.
Unit for flow display	Select “l/min”, “m3/h”, “l/s”, “gpm” or “lpm” to be displayed on the control of the system.
Format for time and date	The date is shown in the display of the system in the selected format. Hereby %d stands for day, %m for month, %y for year, %H for hour and %M for minute.
Mode at start-up	The mode selected herein will be used when the system starts after the power supply is turned on. This is especially important when the user, for instance following a power failure during the chemical-supported cleaning, wants to start in the cleaning mode in order to prevent that cleaning chemicals reach the pipe network, which would occur if the system would immediately jump into the filtration mode. However, it may be just as important that the system immediately goes back into the filtration mode following a power failure, for instance in order to fill an overhead tank over night.
Backlight of display always on?	With this option, the backlight of the display can be turned on continuously.
Interval to log data	Data is always logged upon an event, means when the system changes modes, actuates devices or reports alerts. In addition to that, the system also logs data in time-intervals, which can be set herein.

Parameters	Description
Usage of Dosing-Pump #2 (DO6)?	Select if the second dosing pump connected to the Connectivity Kit is to be used to dose chemicals during filtration or as a second dosing-pump during a backwash sequence.
Daily UF-controller reset to restart internet connection?	Turn on “Auto Reset” once a modem is installed. This terminates and resets the internet connection once a day, which is sometimes required by internet providers.
Time-of-day for automatic UF-unit reset	Set the time at which an automatic reset of the control should take place. Only applies if a daily reset is selected.
Permeability of new Filter at 20°C (l/(h*m2*bar))	Default setting: P=400 l/(m2hbar).
Membrane surface area (m2)	Virex Pro: A = 16 m^2 Phoenix 4: A = 60 m^2 Phoenix 7: A = 120 m^2 Phoenix 10: A = 240 m^2 Phoenix 20: A = 360 m^2
Q/dp of new filters at 20°C (l/min/bar)	The permeability in this fields is calculated after clicking on “calculate”.
Temperature (enter 0 to use sensor, if existing) (°C)	Enter the water temperature here. Please adjust the water temperature regularly if it changes more than 3°C. If 0 (zero) is entered, the controller uses the values delivered by a temperature sensor (optionally available).
Delay between valves switching (s)	Determines, how long the controller waits between switching valves during a process sequence.
Delay between pump switching by (s)	Determines, how long the controller waits between the last step (e.g. opening a valve) and before turning a pump on or off.
Delay compressor switching by (s)	Determines, how long the controller waits between the last step (e.g. opening a valve) and before turning the compressor on.
Menu time-out	The menu jumps back from sub-menus to the main menu after an idle period which can be set herein.
LED Full scale at Q/dp below (related to new filters) (%)	The 5 LEDs below the display of the control are intended to signal the users the fouling conditions of the system. LED 1 (very left) if lit when the filters are new or the permeability of the filters in the system is close to new. All 5 LEDs are lit when the permeability set herein is reached. e.g. set the full LED deflection to 60%, so the LEDs will lite up as follows: 1 LED (very left): 100% Permeability 2 LEDs: <90% 3 LEDs: <80% 4 LEDs: <70% 5 LEDs: <60%
Monitor transmembrane pressure (TMP) during filtration?	If this box is checked, the system monitors the system TMP during filtration. This option is strongly recommended to be activated at all times to help prevent the membranes being damaged by water-hammer.
Max. Transmembrane pressure during filtration (bar)	TMP during filtration may never exceed 2,5 bar (36.2 psi)
Monitor transmembrane pressure (TMP) during backwash?	If this box is checked, the system monitors the system TMP during backwash. This option is strongly recommended to be activated at all times to help prevent the membranes being damaged by water-hammer as well as the system being damaged by too high operating pressures.
Max. Transmembrane pressure during backwash (bar)	TMP during filtration may never exceed 5 bar (72.5 psi)
Sensor-setting Phoenix?	This box needs to be checked if the control is mounted on a Phoenix system, it needs to be unchecked on a Virex system.
CV of feed-valves	Do not change.

Parameters	Description
Parallel filters? Uncheck if Phoenix 4 is installed	The only system that is equipped with a Seccua Control Pro as described in this manual and which does not have parallel filter operation, is the Phoenix 4. With all other systems, this box must be checked.
Check valve in feed line	Ideally a check valve is built into the feed line and this option is chosen. Uncheck the box “Feed check valve” if no check valve is built in.
V1 open when unpowered	Check with standard installation
V2 open when unpowered	Uncheck with standard Installation
V3 open when unpowered	Check with standard installation
V4 open when unpowered	Uncheck with standard Installation
V5 open when unpowered	Check with standard Installation
Pressure at 20 mA sensor-signal? (bar)	The pressure sensors shipped with the system report 10 bar at 20 mA.
Input signal volumetric flow-meter?	Virex Pro: Frequency Phoenix: 4-20 mA
Flow-meter 4-20 mA Flow at 20 mA signal (l/min)	Factory default for volumetric flow sensor: Phoenix 4: 250 l/min Phoenix 7: 500 l/min Phoenix 10: 1000 l/min Phoenix 20: 1176 l/min This value is also corresponding to the 20mA signal of the analog volumetric flow output.
Virex flow sensor, correction factor (pulse/liter)	Default: 765. Do not change.
Min. flow below which no permeability is calculated (l/min)	3 l/min
Read signals through CAN-Bus (ext. alert, turbidity, level)?	If this box if checked, the system is neglecting it's own input-interfaces for external alerts, turbidity and tank-levels, but uses the signals as delivered by the CAN-Bus.
Close feed-valves while other parallel units are cleaning?	If units are operating in parallel, the units are connected though a CAN-Bus and one of the unit is going into a backwash by turning the BW-pump on, the other units go into standby-mode during the one unit backwashes, closing their feed valves. This prevents water from the backwash line entering into all units. The units come back up online after the cleaning sequence is completed.
Log feed pressures above (bar)	This function logs feed-pressures (P1) that exceed the value entered here. With the help of this function, water hammer that occur in the line and that might damage the system can be logged. Default: 5 bar (72.5 psi)
No cleaning or membrane testing during filtration	By checking this box, the system is prevented from interrupting is filtration mode while water is flowing. Events like cleaning or membrane testing are delayed until water-flow stops.
State at CAN connection loss	The unit jumps into this mode if the CAN connection fails.
Maximum tolerated CAN down time (s)	Standard setting: 3s

11) Names of operating modes

Within this form all terms are defined, which are displayed in the controller during its single steps of operation. If the controller is shipped in different languages, these strings can be translated.

12) Other strings

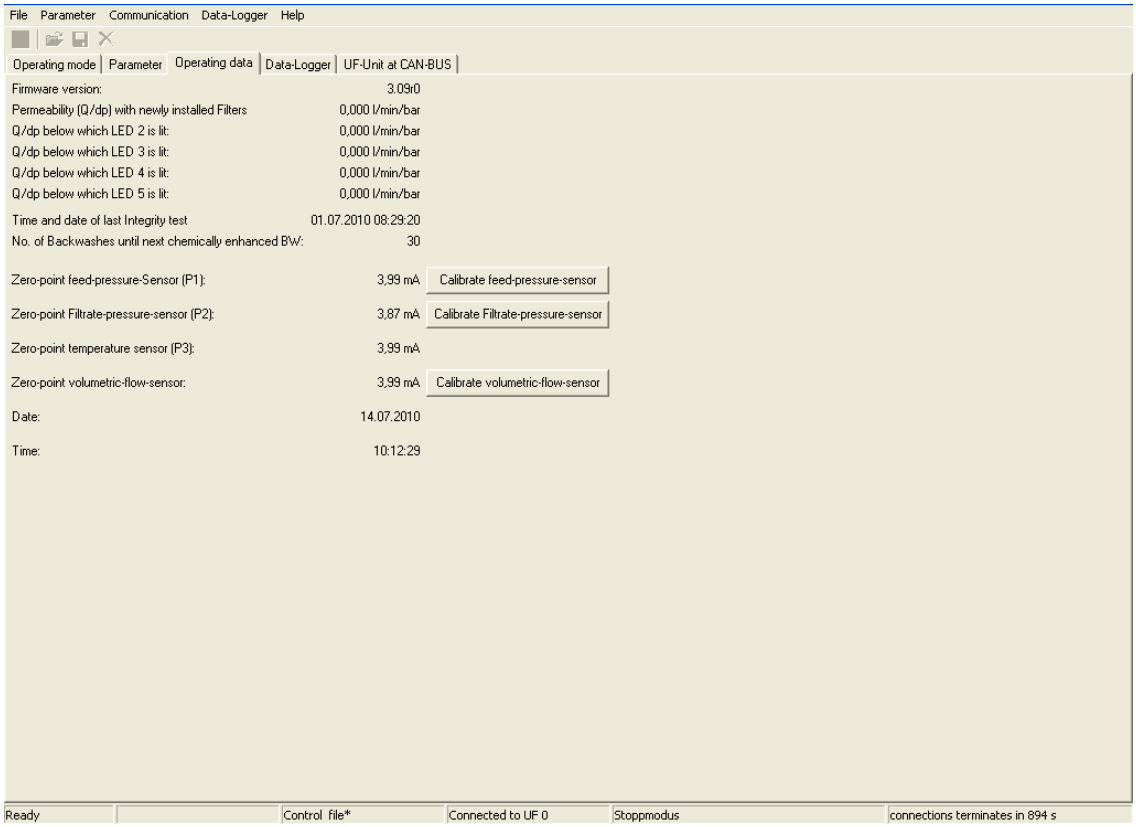
This form contains the strings that are used in the control to describe error messages.

13) Main menu items

This form contains the strings that are used in the main menu of the control.

8.5 Display of the operating data

1) Display of the operating data



Picture 27: Form "Operating data"

The following values are displayed in the tab page "Operating data":

Parameters	Description
Firmware version	Displays the current firmware version, which is installed on the connected control unit.
Q/dp of new filter at 20°C	Displays the permeability of a new set of membrane filters in liters/min/bar (at a water temperature of 20°C)
Q/dp below which LED X lights up	See “LED Full scale at Q/dp below” page 59.
Time and date of last integrity test	Time and date of last integrity test
No. of backwashes until next chemically enhanced BW	This only appears with installed chemical dosage during backwash as well as after activation of the respective functions. It displays the number of remaining backwashes until the next chemically-enhanced cleaning cycle.
Zero-point feed-pressure-Sensor (P1)	The zero point of the pressure sensor P1 (inlet pressure of the left filter module). At a pressure of 0 psi the sensor supplies a value of XX mA (see display). The value should not be smaller than 3.9 mA and should not be greater than 4.1 mA.
Zero-point Filtrate-pressure-sensor (P2)	Zero point of the pressure sensor P2 (pressure on the filtrate side of the module). At a pressure of 0 psi the sensor supplies a value of XX mA (see display). The value should not be smaller than 3.9 mA and should not be greater than 4.1 mA.

Parameters	Description
Zero-point volumetric-flow-sensor:	Only appears with Phoenix systems.
Date	Make sure the system's date is set properly.

2) Calibration of the sensors

In order to calibrate the sensors of the system, the user must proceed as follows:

1. Render the system pressure-less on all sides of the system (inlet, drain, filtrate) against the surrounding pressure.
2. Switch the system into the filtration mode, then back into the stop mode.
3. Switch into the menu "Operating data".
4. Press the buttons "Calibrate p1", "Calibrate p2", in succession.
5. Observe at which value the zero point is obtained. A deviation of more than 3.8 to 4.2 mA indicates an error in the measurement (is the system really pressure-less?) or may indicate a faulty sensor.

Note:
We recommend to calibrate the sensors annually. This way defects of the sensors or dirty sensors can be detected too.

8.6 Data logger

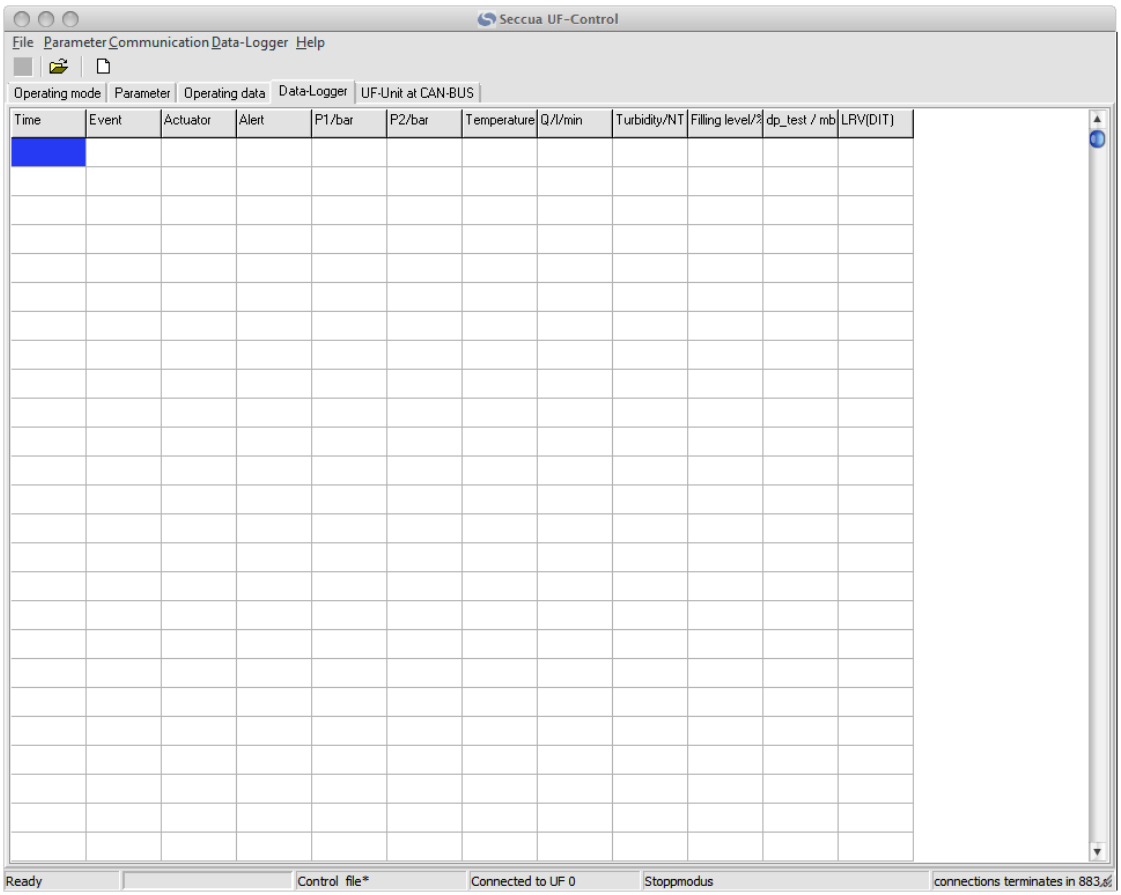
The data logger of the system records up to 16000 sets of events. An "event" is defined as each change of the operation status, each manual intervention on the control unit as well as each alarm message. Also logging at fixed intervals counts as an event.

The following data is recorded and saved for each event:

- Time and date of the event,
- the output, which was connected or accessed during the event,
- the actuator actuated,
- the alarm code, if applicable,
- the pressures of the sensors,
- the temperature, if a sensor is installed
- the volumetric flow before the change of the operation status (if applicable),
- the measured turbidity (with a connected turbidity-meter),
- the filling level of the feed- or filtrate tank (if connected).

During an integrity test it is also saved:

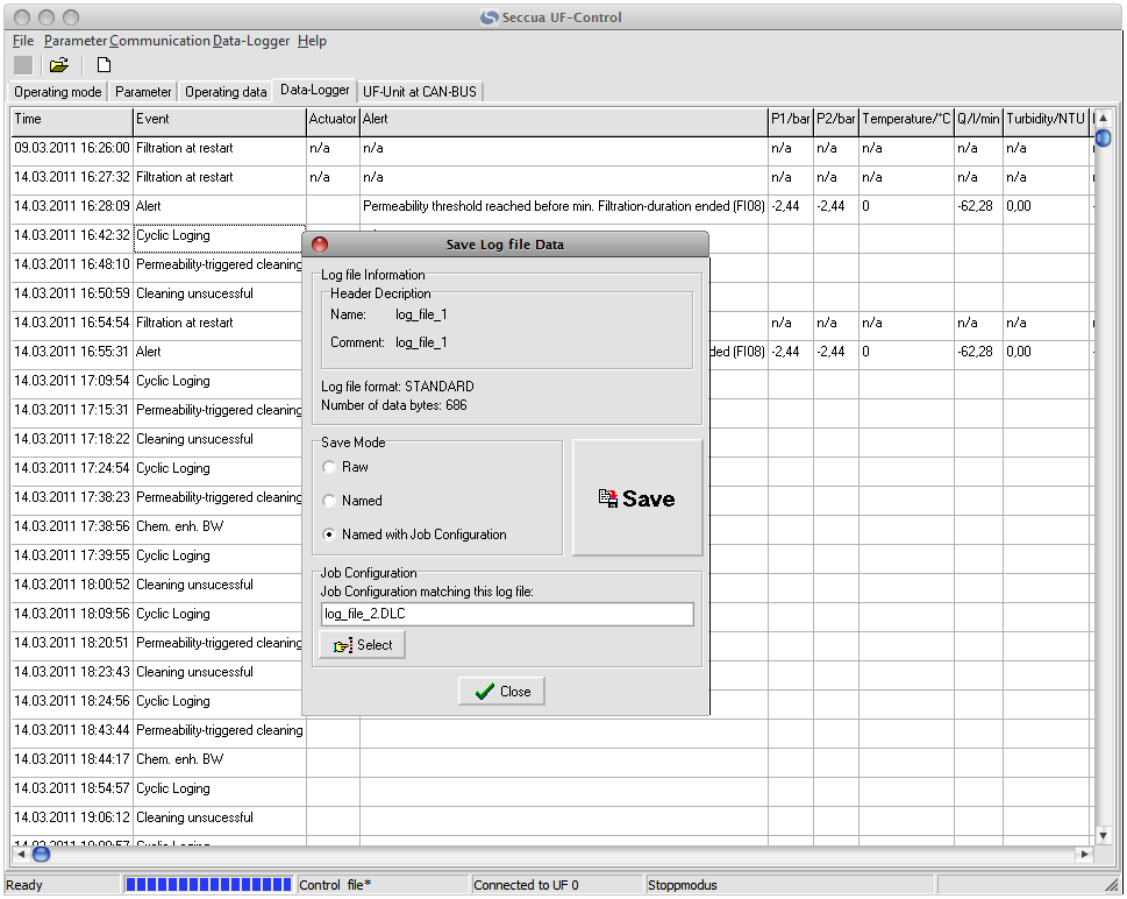
- the pressure decay measured during the last DIT
- the resulting LRV (DIT)



Picture 28: Data logger

Read outs from the data logger are performed as follows:

1. Create a connection with the control unit (either via the USB bus or the Internet, if installed)
2. Switch into the menu "Data logger"
3. Read out the data logger via the function "Data logger" → "Load Data-log" or press the keys Ctrl-L on the keyboard.
4. You will now get the option, which section of the data-logger to read out. The data-logger is divided into two sections with altogether more than 16,000 data-sets. If the first section is full, the second section is used. If the second section is full the first will be deleted completely and used again. Select the section you want to read and click “Read”.



Picture 29: Export function of the data-logger

5. IIn the next dialogs just select „Close“, “Yes” and “Close”.

To evaluate the data on a PC you can save them in the .csv file format. To do so use the menu function “Data-Logger” → „Save as CSV“.

Note:

The export function of the data logger allows processing of the data in e.g. MS Excel or other spreadsheet programs. Frequent evaluation of the data logger is recommended both to assess the performance of the system as well as for process optimization.

When the data logger is full, it will begin to overwrite the first entries.

8.7 Firmware and control on the unit

The firmware is software that is embedded in the control unit.

1) Saving the settings in a file

The settings, which are performed in the control unit, can be copied to a file on the connected PC. It is recommended to save the parameters before performing any changes in order to ensure that the original state can be restored.

The instructions on how to save the parameters can be found in chapter 8.4 , paragraph3) "Saving the settings to file" (page 46).

Important!

It can happen that the new firmware is not compatible with the old set of parameters. Ask your Seccua-Partner if this is the case for the desired firmware version! Should it be the case you need to do the settings manually or you send your parameter files to Seccua. We will provide you with a suitable new parameter set.

Note:
In the case of a problem it is recommended to read out both the parameter file as well as the current data logger from the control unit before contacting the hotline and keep the data ready for the conversation.

2) Loading new firmware

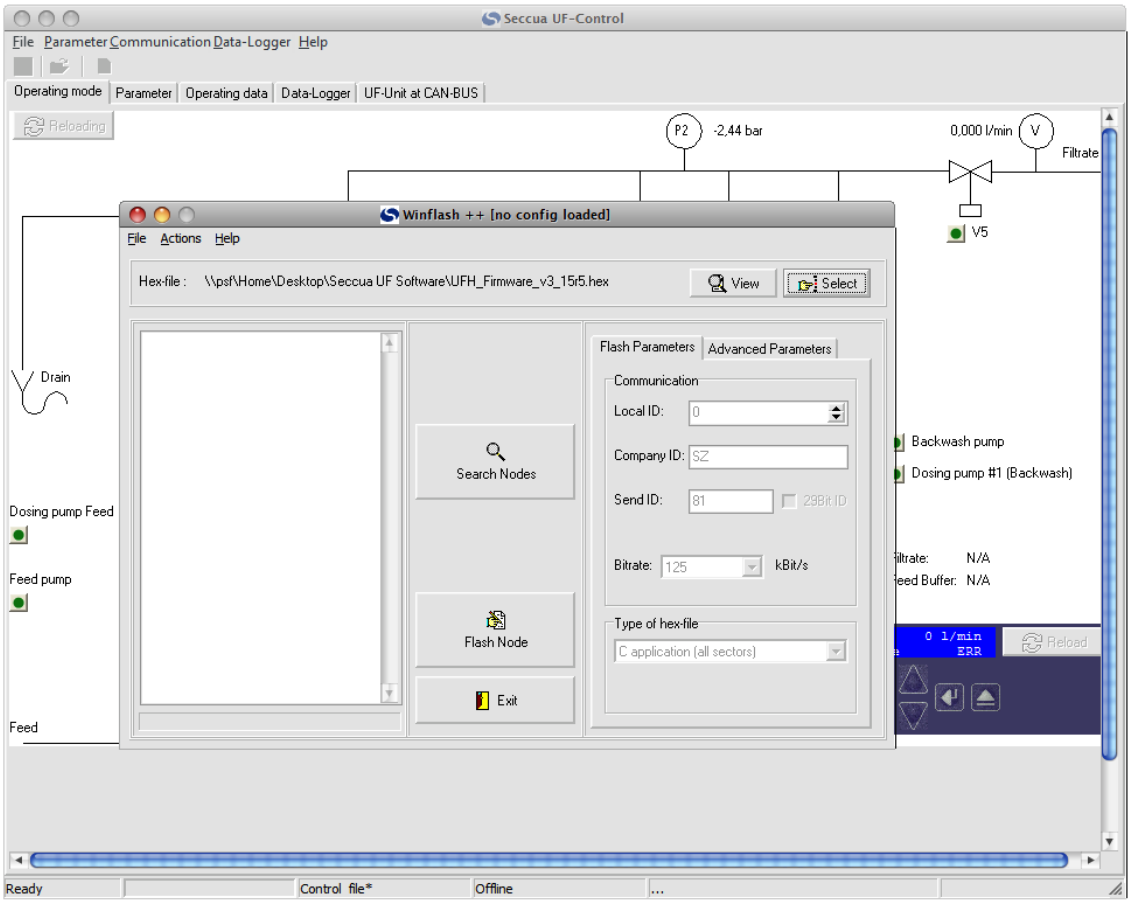
New versions of the firmware can be loaded onto the control unit at any time. Nevertheless we recommend not to overwrite old firmware in systems that work without error and which do not require certain new features, only ofred by newer firmware.

In order to upgrade firmware, proceed as follows:

1. Connect the control unit to a PC with the USB cable.
2. Open the PC software.
3. Click on "Communication" and then on ".Transfer Firmware to UF-Control..".
4. A dialog appears where you can press “Select” to open a file browser and select the correct firmware file (HEX-file).
5. Click on "Flash node".

Note:
The new firmware is loaded on the control unit. Do not disrupt this process as this could lead to damaging of the control unit! You can follow the current status of the loading procedure via the progress display.

6. After successfully transferring the firmware, the flash program will ask whether the control unit should be started. ("Start all nodes?") Select this option and confirm by pressing "OK".
7. The loading procedure has now been completed.



Picture 30: Menu for transferring "flashing" new firmware onto a control

Please ensure that the version of the PC software that you are using is compatible with the version of the firmware that you want to load on the control unit. A version of the PC software can be used during the flashing procedure, which is not compatible with the

version of the software on the control unit before the flashing is performed, e.g. you can install new PC software on the PC, then load new firmware on the control unit and then reconnect with the control unit.

After flashing you need to overwrite the state names which are stored in a separate memory. Ask your Seccua partner or the Seccua support for a parameter set in English language and use the menu “Parameter” and the command “Load all sets of parameters from files into UF control”.

Caution:

The versions of the PC software and the firmware must be compatible with each other. Before installing a new version of the PC software or the firmware, please enquire with your service partner whether your software versions are compatible.

9. Maintenance and cleaning

In general in part due to the intelligent control unit, ultrafiltration systems require little maintenance. The intelligent control software automatically recognizes possible errors and informs the user of these via the alarm signal on the display. Optionally, in the case of malfunctions a text message can be sent to a cellular phone.

9.1 Storage and preservation of filter modules

1) General

The utilized filter modules are delivered conserved with the conservation medium E223 (sodium bisulfite).

Warning:

The SeccuMem Pro ® modules do not contain any anti-freeze agent. Therefore, the ultrafiltration modules may not be exposed to frost as this can cause damage to the membrane!

2) Storage of new modules and after operation

Please use the following description to prepare SeccuMem Pro ® modules for storage under the following circumstances:

1. Storage of SeccuMem® Pro (SMP) – modules as spare-parts,
2. Storage of SMP-modules in-situ, after those have been in operation.
3. Storage of SMP-modules in newly shipped units.

a) Introduction

SMP module are shipped ex-works preserved using a 0,95% Sodium-Bisulfite-Solution (SBS).

b) Storage as spare parts

Originally packed SMP-modules can be stored for up to two (2) years under the following conditions:

1. The original packaging must not be removed and must not be damaged, so the modules are prevented from drying out
2. The modules may not be exposed to direct sunlight and must be stored in a cool, dry place.
3. The Sodium-Bisulfite solution (SBS) must be replaced according to the following schedule:

Ambient temperature (°C)	Replacement of solution every
2-30	24 month
2-35	18 month
2-45	12 month

4. The SBS-solution is exchanged as follows:
   a. Remove the protective end-caps from the modules,
   b. Drain the old storage-solution from the modules completely,
   c. Replace the storage solution with up to 3,5 Liters (0,9 US-gallons) of fresh solution, made up from 3,5 Liters of fresh City-Water (or better quality), mixed with 25 gram (0,9 ounces) of Sodium-Bisulfite-Powder.

Picture 31: Filling the module with storage-solution

d. Place the end caps onto the modules again and seal the edges of the end-caps to the modules with tape, so the modules are prevent from drying out and the module is kept clean.

c) Storage of modules after operation

SMP-modules which have already been in operation can safely be kept for up to three (3) months, if after a thorough chemical cleaning of the modules, such are preserved using a SBS-solution, concentrated as described below:

Duration of Storage	Concentration of SBS-solution
Up to 2 weeks	0.10%
Up to 1 month	0.50%
Up to 3 month	0.95%

Table: Concentration of SBS-solution for Storage after operation

Make sure the modules are sealed using the original Seccua protective end caps and are prevented from drying out as well as stored in a cool and dry place. Store the modules vertically with the opening facing upwards.

9.2 Exchange of filter modules

The system is fitted with two filter modules each (F1 = as seen from the left front and F2 = as seen from the right front).

Note:
We recommend having the filter modules in the system dismantled and exchanged by an authorized service partner!

Follow the following instruction when dismantling the filter modules:

1. Press the "Stop" button.
2. The system must now be in a pressure-less condition!
3. If installed, close the stop valves in the inlet and filtrate line.

4. Only disconnect the system if you can disconnect the system through stop valves from the mains or else the system will switch into the filtration mode during the powerless state and the inlet valves as well as the filtrate valve will be opened.
5. Ensure that any escaping water is collected (place a tub under the system).

Warning:

Ensure that the system is completely pressure-less when filter modules are removed. If the system is not pressure-less, there is an increased risk of injury and no changes in the system may be performed!

6. Now remove the head screws (with a cross-head screwdriver) on the sides of the cover and take it from the system.
7. Now remove the bracket for the modules by unscrewing the screws M8 x 16..
8. Now pull out the modules from the adaper block upright.

Note:

The Modules are filled up with water. Please drain the module water in a bucket.

Note:

Please note that during disassembly of filter modules these must always been removed upwards (vertically) from the system. Do not exert any force on the side of the filter module as these might lead to damage of the adapter pipes on the bottom of the filter modules.

9. Please check the big grey O-rings. These remain in the adapter block and are reused for the new filter module, provided these are not damaged. Exchange damaged O-rings
10. Unpack the new modules and drain the preservative agent into a bucket.
11. Insert the new filter modules upright into the adapter block.
12. Fix the brackets into the groove of the module and screw in the screws M8 x 16 hand-tight.
13. Tie the M8 x 16 screws crosswise using a 6mm hexagon wrench.
14. Carry out a cleaning of the system and a disinfection of the ultrafiltration module as described in this manual.
15. You can now take this system back into operation.

10. Troubleshooting

Problem	Possible cause	Rectification
The valves do not switch, the display remains dark	The power connection is faulty.	Verify that the power cable is connected correctly.
	The control unit (firmware) is defective.	Have the control unit replaced by your service partner.
	The valves of the system were not connected correctly with the control unit.	Please contact the manufacturer.
No water comes out of the filter outlet	System is resting mode	Start the filtration mode as described in the manual.
	Blocking device in the feed line to the system (if installed) closed.	Open the blocking device.
	Malfunction of the valves of the system.	Verify the function of the valve (see page 64 ff.). Have it replaced if necessary.
An **insufficient** amount of water comes out of the filtration outlet	The system is in the backwash cycle.	Wait until the backwash cycle has been completed.
	Membrane capillaries are strongly contaminated with particles from the raw water (filtrate volume flow was higher at the time of commissioning and has reduced during operation).	Start a backwash as described in the manual (page 64 ff.). If necessary, carry out the following steps one after the other: ▪ Backwash ▪ Sterilization of the system ▪ Backwash
	Intervals between the backwashes is too long (filtrate volume flow was higher at the time of commissioning and has reduced during operation).	Adjust the settings for the rinsing of the system to the quality of the raw water.
	Drain valve is sticking, water continuously runs out of the drain valve.	Clean the drain valve or if necessary replace it.
	Inlet pressure to the system is too low.	Contact your service partner or installer and ask them about possibilities for increasing the pressure upstream of the system.
Water suddenly tastes bad	The conservation solution of the filter modules was not rinsed out completely.	The modules are conserved with a harmless solution. Rinse the system at the time of commissioning or after the installation of new modules for a sufficiently long time to remove this solution.
Water continuously runs from the drain of the unit.	The drain valve is sticking.	Clean the drain valve or if necessary replace it.
	The control unit sends a constant signal to the valve.	Check the control unit.
Rinsing runs for too long.	Incorrect setting in the program	Change the settings in the control unit as described.

11. Limited Warranty

This system was manufactured to the highest quality standards. The warranty and guarantee conditions of our general terms and conditions apply.

The guarantee voids if the system is not operated, stored, transported or mounted properly according to the conditions described in this manual.

Warning

The removal performance of pathogens by ultrafiltration membranes is very high. The manufacturer has specified removal rate of 99.99% for viruses and 99.999% for bacteria. However, complete germ-removal cannot be guaranteed by any technical system – even with an ultrafiltration membrane.

The warranty obligor for each Region or country of purchase is identified below and is referred to as ”Seccua“ herein. Seccua‘s warranty obligations are limited to the terms set forth below.

Warranty Coverage. Seccua warrants Seccua-branded hardware against defects in materials and workmanship when installed and operated within Seccua‘s specifications for a period of ONE (1) YEAR from the date of startup by the original end-user, or eighteen (18) months from date of ex-factory shipment from Seccua, whichever comes first (”Warranty Period”). If a hardware defect arises and a valid claim is received within the Warranty Period Seccua will, at its option, exchange the part with a new, or refurbished part that is at least functionally equivalent to the original part. A replacement part assumes the remaining warranty of the original part. When a part is exchanged, any replacement item becomes the original end-user’s property and the replaced item becomes Seccua‘s property.

Exclusions and limitations. This Limited Warranty applies only to hardware parts manufactured by or for Seccua that may be identified by the “Seccua” trademark, trade name, or logo affixed to them. The Limited Warranty does not apply to any non- Seccua part or any software, even if packaged or sold with Seccua hardware. Manufacturers, suppliers, or publishers, other than Seccua, may provide their own warranties, but Seccua, in so far as it is permitted by law, provides its parts “as is”. Software distributed by Seccua with or without the Seccua brand name (including, but not limited to system software) is not covered under this Limited Warranty. Refer to the licensing agreement accompanying the software for details of your rights with respect to its use.

Seccua does not warrant that the operation of the part will be uninterrupted or error-free. Seccua is not responsible for damage arising from failure of the parts.

This warranty does not apply: (a) to damage caused by non-Seccua products; (b) to damage caused by accident, abuse, misuse, flood, fire, earthquake or other external causes; (c) to damage caused by operating the part outside the permitted uses described by Seccua; (d) to damage caused by service (including upgrades and expansions) performed by anyone who is not a representative of Seccua or a Seccua Authorized Service Provider authorized to perform service; (e) to a part that has been modified to significantly alter functionality or capability without the written permission of Seccua; (f) to consumable parts, such as filter modules, unless damage has occurred due to a defect in materials or workmanship; or (g) if any serial number has been removed or defaced.

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REMEDIES AND CONDITIONS, WHETHER ORAL OR WRITTEN, STATUTORY, EXPRESS OR IMPLIED. AS PERMITTED BY APPLICABLE LAW, SECCUA SPECIFICALLY DISCLAIMS ANY AND ALL STATUTORY OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND WARRANTIES AGAINST HIDDEN OR LATENT DEFECTS. IF SECCUA CANNOT LAWFULLY DISCLAIM STATUTORY OR IMPLIED WARRANTIES THEN TO THE EXTENT PERMITTED BY LAW, ALL SUCH WARRANTIES SHALL BE LIMITED IN DURATION TO THE DURATION OF THIS EXPRESS WARRANTY AND TO REPAIR OR REPLACEMENT SERVICE AS DETERMINED BY SECCUA IN ITS SOLE DISCRETION. No Seccua reseller, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

TO THE EXTENT PERMITTED BY LAW, SECCUA IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY, INCLUDING BUT NOT LIMITED TO LOSS OF REVENUE; LOSS OF ACTUAL OR ANTICIPATED PROFITS (INCLUDING LOSS OF PROFITS ON CONTRACTS); LOSS OF THE USE OF MONEY; LOSS OF ANTICIPATED SAVINGS; LOSS OF BUSINESS; LOSS OF OPPORTUNITY; LOSS OF GOODWILL; LOSS OF REPUTATION; LOSS OF, DAMAGE TO OR CORRUPTION OF DATA; OR ANY INDIRECT OR CONSEQUENTIAL LOSS OR DAMAGE HOWSOEVER CAUSED INCLUDING THE REPLACEMENT OF EQUIPMENT AND PROPERTY. THE FOREGOING LIMITATION SHALL NOT APPLY TO DEATH OR PERSONAL INJURY CLAIMS. SECCUA SPECIFICALLY DOES NOT REPRESENT THAT IT WILL BE ABLE TO REPAIR ANY PART UNDER THIS WARRANTY OR MAKE A PART EXCHANGE WITHOUT RISK OF INTERRUPTION OF WATER SUPPLIES. SECCUA SPECIFICALLY DOES NOT REPRESENT FULL REMOVAL OF PATHOGENS BY ITS SYSTEMS AT ALL TIMES.

Consumer Protection Laws. FOR CONSUMERS WHO HAVE THE BENEFIT OF CONSUMER PROTECTION LAWS OR REGULATIONS IN THEIR COUNTRY OF PURCHASE OR, IF DIFFERENT, THEIR COUNTRY OF RESIDENCE, THE BENEFITS CONFERRED BY THIS WARRANTY ARE IN ADDITION TO ALL RIGHTS AND REMEDIES CONVEYED BY SUCH CONSUMER PROTECTION LAWS AND REGULATIONS. Some countries, states and provinces do not allow the exclusion or limitation of incidental or consequential damages or exclusions or limitations on the duration of implied warranties or conditions, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary by country, state or province. This Limited Warranty is governed by and construed under the laws of the country or state in which the part purchase took place.

Region	Seccua	Address
The Americas	Seccua Americas LLC	15508 West Bell Road, Suite 101-440, Surprise, AZ (85374 (USA)
All other countries	Seccua GmbH	Krummbachstr. 8, 86989 Steingaden, Germany

12. Appendix

12.1 Performance data

		Virex Pro 1000
Membrane area		16 m²
Filter output:		
- Fluxrate long term		1280 – 2.560 l/h (290-581 gal/h)
- at a pressure difference of 1.0 bar/14,5 psi		1,3 liter/second (0,34gal/sec)
Removal performance (DHS certified)[2]		
- for viruses		> 99.99 %
- for bacteria		> 99.999 %
- for parasites		> 99.999 %
Typical water consumption during flushing		< 2 %

[1] The Filter output was calculated at 10 °C/50°F water temperature using drinking water with new membranes.

[2] The retention rate for bacteria and viruses was determined under the supervision of the California Department of Public Health (USA). The removal rate was measured during filtration as part of the treatment of surface water. For the purpose of measurement, the water was dosed with MS2 phage, giardia and cryptosporidium. The retention performance of filters may decrease due to fiber breakage caused by improper operation or aging of the membrane material. Therefore it is recommended to regularly check the filter elements in regard to the integrity of the membrane.

12.2 Filter modules

Membrane	Extra-robust single bore - fiber
Material	Hydrophilic polyether sulfone (PES)
Resistance to chemicals	pH 1-13 (cleaning) pH 2-11 (operation)
- Free chlorine	Max. 200 ppm or 200,000 ppmh
- Hydrogen peroxide	Max. 500 ppm
Nominal pore size	15 nanometers
Separating limit	150,000 Dalton (g/mol)

12.3 Additional systems

Note:

The higher the forward pressure upstream of the system, the greater the filter output. During cleaning, draining is performed through the rinse water line, as a free outflow is required. Here, the pressure is approximately 0 psi. In any case, the difference of the flow pressure between the inlet and drain may not exceed 2.5 bar/36.26psi. If necessary, decrease the outlet line.