xylem
Let's Solve Water

Installation, Operation, and Maintenance Manual

90029201_2.0

Duron 6

EcoTouch UV System

WEDECO
a xylem brand

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1 Introduction and Safety

1.1 Introduction

Purpose of the manual

The purpose of this manual is to provide the necessary information for working with the unit. Read this manual carefully before starting work.

Read and keep the manual

Save this manual for future reference, and keep it readily available at the location of the unit.

Other manuals

See also the safety requirements and information in the original manufacturer's manuals for any other equipment furnished separately for use in this system.

Intended use

WARNING:

Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment and the surroundings. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.

Basis of the manual

This manual is based on the requirements of the relevant EU directives, the relevant standards and on the results of the risk assessment for the types of unit and their application.

1.2 Safety terminology and symbols

About safety messages

Before handling the product, it is important to read, understand, and follow the safety messages and regulations carefully. They are published to prevent these hazards:

- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level		Indication
	DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
	WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
	CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury

Hazard level	Indication
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, which are shown in the following table.

Electrical hazard	Ultraviolet radiation	Electromagnetic field

Hot surface	Mercury

The following table shows symbols for personal protective equipment.

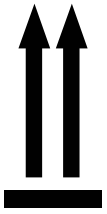
Safety goggles	Face shield

Protective gloves	Safety footwear	Safety helmet

The symbols in the following table show specific precautions.

Do not touch the electrical parts	No unauthorized persons	Disconnect the power supply

Transport and storage symbols

This way up	Keep dry	Fragile, handle with care
The arrows show the upright position.	The crates shall be transported and stored in a dry environment.	These are fragile components. Handle them with special care.
		

1.3 User safety

All regulations, codes, and health and safety directives must be followed.

The site

- The lockout and tagout procedures must be followed before any work is started on the product, such as transport, installation, maintenance, or service.
- The surroundings of the equipment must always be noted. Hazards from the operating site or the surrounding equipment must be taken into attention.

Qualified personnel

Only personnel that are qualified for the UV system are allowed to install, operate, and maintain the UV system.

Repairs

Only authorized Xylem personnel are allowed to repair the UV system.

Personal protective equipment and safety devices

- Suitable and approved personal protective equipment must always be used as required.
- All safety devices must be functional and in use always during operation of the UV system.

1.4 Special hazards

1.4.1 UV exposure

Normal operation

The UV light is shielded when the channel covers are closed. There is no risk of UV exposure for the site operator during normal operation and maintenance.

CAUTION: Ultraviolet (UV) Light Hazard

UV light can burn eyes and skin. Never operate the UV lamps outside of the UV system.

Unshielded operation

In certain situations of maintenance UV light may be emitted from openings.

UV light causes strong sunburn to the skin, and irritates the eyes, leading to conjunctivitis.

Personal protective equipment

Always use applicable personal protective equipment to protect the skin and eyes.

- Use safety goggles or a face shield which are approved for UV light.
- Use clothes which cover your skin completely.

1.4.2 Mercury in UV lamps

The UV lamps contain small amounts of mercury. Depending upon the exposure, mercury is known to be toxic.

WARNING: Chemical Hazard

This product can expose you to Mercury. Mercury is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: *www.P65Warnings.ca.gov*.

Safe disposal

End-of-life products that contain mercury must be managed correctly to protect the public health and the environment.

NOTICE:

The UV lamps contain mercury. They must be disposed of in accordance with the disposal laws.

For more information, see *https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_de* and *www.lamprecycle.org*
1-866-457-6697

1.4.3 Di(2–ethylhexyl)phthalate (DEHP) and cadmium (Cd) in cables

The cables contain small amounts of DEHP and cadmium.

WARNING: Chemical Hazard

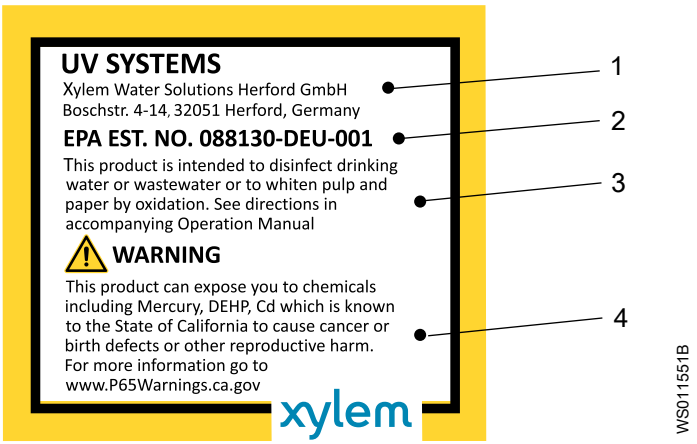
This product can expose you to Di(2-ethylhexyl)phthalate (DEHP). DEHP is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: *www.P65Warnings.ca.gov*.

WARNING: Chemical Hazard

This product can expose you to Cadmium. Cadmium is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: *www.P65Warnings.ca.gov*.

1.4.4 For USA only: Labels for FIFRA and California Proposition 65

This product is regulated in the United States of America by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). In compliance with FIFRA requirements, certain components of this product have the following label.



Item	Description
1	Company name and address
2	Establishment number from Environmental Protection Agency (EPA), USA
3	Intended use of the product and reference to the directions to be followed
4	List of chemicals that this product can expose which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information, go to *www.P65Warnings.ca.gov*.

1.4.5 Interference emission

NOTICE:

This equipment is not intended for use in residential environments. It might not provide adequate protection to radio reception in residential environments.

1.5 Protecting the environment

Emissions and waste disposal

Observe the local regulations and codes regarding:

- Reporting of emissions to the appropriate authorities
- Sorting, recycling and disposal of solid or liquid waste
- Clean-up of spills

Exceptional sites

CAUTION: Radiation Hazard

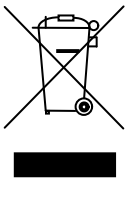
Do NOT send the product to Xylem if it has been exposed to nuclear radiation, unless Xylem has been informed and appropriate actions have been agreed upon.

1.6 End-of-life product disposal

Handle and dispose of all waste in compliance with local laws and regulations.

EU and UK only: Correct disposal of this product — waste electrical and electronic equipment

- EU: Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)
- UK: SI 2013 No. 3113



This marking on the product, accessories or literature indicates that the product should not be disposed of with other waste at the end of its working life.

1.7 Spare parts

CAUTION:

Only use the manufacturer's original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage, and injuries as well as void the warranty.

1.8 Warranty

Warranties are regulated by the sales agreement between the parties.

2 Transportation and Storage

2.1 Precautions

CAUTION:

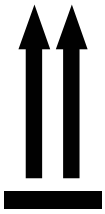
The operator must be aware of safety precautions to prevent physical injury.

CAUTION: Crush Hazard

Make sure that the unit cannot roll or fall over and injure people or damage property.

Transport and storage symbols

NOTICE:

This way up	Keep dry	Handle the sensor with care.
The arrows show the upright position.	The crates shall be transported and stored in a dry environment.	These are fragile components. Handle them with special care.
		

Personal protective equipment

NOTICE:

The following personal protective equipment is needed:

- Safety gloves
- Safety footwear
- Safety helmet

2.2 Examine the delivery

2.2.1 Examine the package

1. Open the box.
2. Examine the package for damaged or missing items upon delivery.
   All the parts or assemblies that are shipped individually are listed on the packing list.
   The electronic ballasts are shipped in separate transport boxes.
3. Record any damaged or missing items:
   a) Contact the local sales and service representative to file a claim.
   b) If anything is broken or defective, then file a claim with the shipping company.

If the product is picked up at a distributor, make a claim directly to the distributor.

2.2.2 Examine the unit

1. Remove packing materials from the product.
   Dispose of all packing materials in accordance with local regulations.
2. To determine whether any parts have been damaged or are missing, examine the product.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
   Use care around nails and straps.
4. If there is any issue, then contact a sales representative.

2.3 Lifting guidelines

2.3.1 Lifting

Always inspect the lifting equipment and tackle before starting any work.

WARNING: Crush Hazard

Always lift the unit by its designated lifting points.
Use suitable lifting equipment and ensure that the product is properly harnessed.
Wear personal protective equipment.
Stay clear of cables and suspended loads.

NOTICE:

Never lift the unit by its cables or hose.

Lifting equipment

Lifting equipment is always required to handle the unit. The lifting equipment must fulfill the following requirements:

- The minimum height between the lifting hook and the floor must be sufficient to lift the unit. For more information, see Overview Drawing in the binder.
- The lifting equipment must be able to hoist the unit straight up and down, preferably without the need for resetting the lifting hook.
- The lifting equipment must be correctly anchored and in good condition.
- The lifting equipment must support the weight of the entire assembly. For more information, see the packing list.
- Only authorized personnel may use the lifting equipment.

2.4 Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

Protect the product against humidity, heat sources, and mechanical damage.

NOTICE:

Do not place heavy weights on the packed product.

Stacking limit

The stacking limit of the packaging material is printed on the packaging material and given on the packing list. For more information, see Storage and Handling Guideline, STDS-003 in the binder.

Ambient condition

NOTICE:

Protect the unit from freezing temperature.

Temperature	5°C (41°F) – 40°C (104°F)
Humidity	Less than 75% without condensation

2.4.1 Long-term storage

Prepare the UV system

If the UV system is stored for the winter, this procedure must be followed.

1. Lift each UV module.

Lift type	Action
Electric	For information see, *Lift the UV module* on page 84.
Manual	For information see, *Lift the UV module* on page 86.

2. Clean the UV modules.

   For more information, see step *3* on page 91.
3. Disconnect the following items:
   - UV module connector
   - UV lamp connectors
   - Ground cable
4. If the UV lamp modules must be stored indoors, do the following steps:
   a) Use the quick connector to release each UV lamp module from the UV modules.
   b) Carefully slide each UV lamp module from the UV modules.
   c) Identify the positions of each UV lamp module correctly.

      Position markings must not be made on the quartz sleeves.
5. If the UV modules must be stored indoors, remove the UV modules.

   For more information, see *UV module removal* on page 88.
6. Turn off the main isolators of the following items:
   - Lift control cabinet
   - Wiper control cabinet
7. Turn off and lock out the main isolator of the control cabinet.

- Drain the water from the UV channels.
- If the control cabinet is not in a climate-controlled location, turn on the external power to the control cabinet. The external power is used to operate the heaters that prevent condensation.

Restore the UV system

Before the UV system is restored after the winter, the following conditions must be checked:

- There must not be any unwanted deposits on the UV system.
- There must be effluent in the UV channels.

1. Clean each UV module.

   For more information, see step *3* on page 91.
2. If the UV lamp modules were removed, do the following steps:
   a) Identify the correct position of each UV lamp module.
   b) Carefully slide the UV lamp modules into the UV modules.

      The position labels on the UV lamp modules must be removed.
   c) Use the quick connector to connect each UV lamp module to the UV modules.

3. If the UV modules were removed, install the UV modules.
   For more information, see *UV module installation* on page 90.
4. Turn on the main isolators of the following items:
   - Lift control cabinet
   - Wiper control cabinet
5. After 30 minutes, turn on the main isolator of the control cabinet.
   The UV lamps turn on immediately and attain full power after 10 minutes.

3 System Description

3.1 System overview

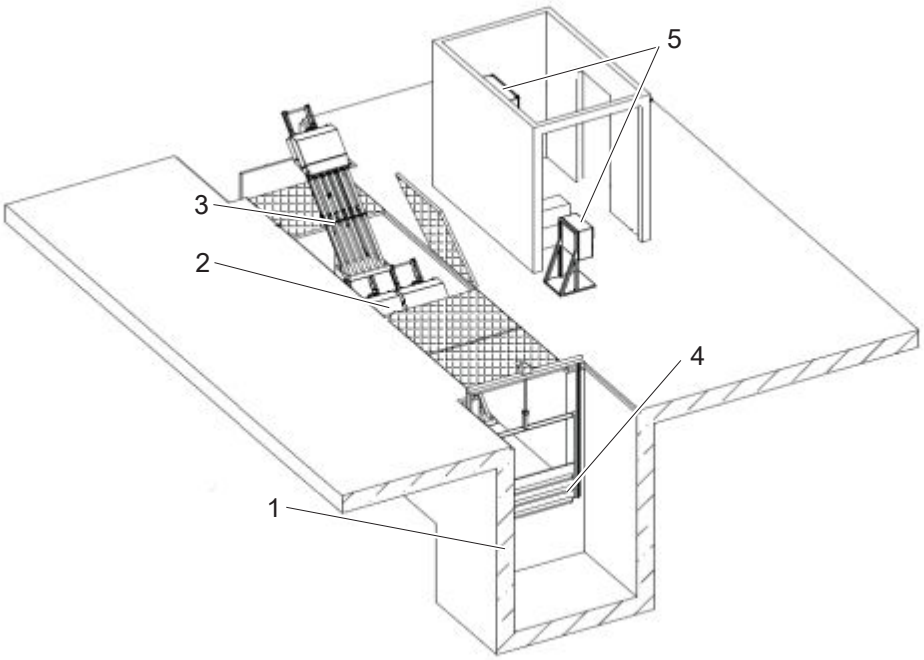
Intended use

The system is installed in a concrete channel.

Application

- Municipal wastewater disinfection for effluents that are treated in these stages:
  - Primary
  - Secondary
  - Tertiary
- Aquaculture
- Stormwater overflow
- Water reuse

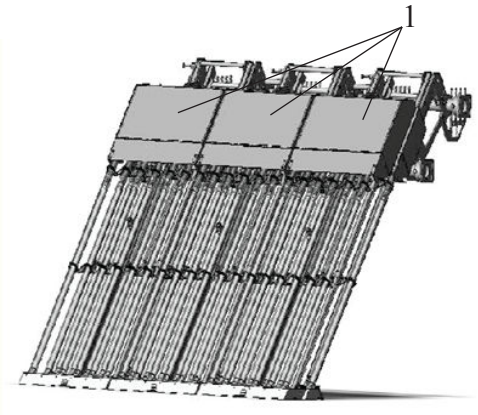
System design



Position	Item	Description
1	UV channel	Controls the effluent water For more information, see *UV channel* on page 27.
2	UV bank	Consists of one or more UV modules
3	Automatic wiping system	Consists of the following options: • Pneumatic, includes an air compressor • Electric One option is available according to the type of drive.

Position	Item	Description
4	Level control	Consists of the following items: • Low-level probe • Ultrasonic level sensor • Weir of one of the following types: – Downward opening penstock (DOP) – Finger weir – Fixed pipe weir
-	UV transmittance (UVT) monitor	Measures the UV transmittance of the water
5	Cabinets	Consists of the following cabinets: • Control • Lift control This cabinet is available when the module guide rack has an electric lift. • Wiper control
-	Customer-supplied parts	Consists of the following parts: • Flowmeter • UV channel cover • Isolation gates for the UV channel inlet

3.2 UV bank



1. UV modules

The UV bank is a modular system that consists of one or more UV modules.

UV module

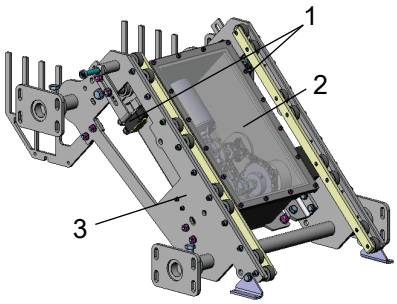
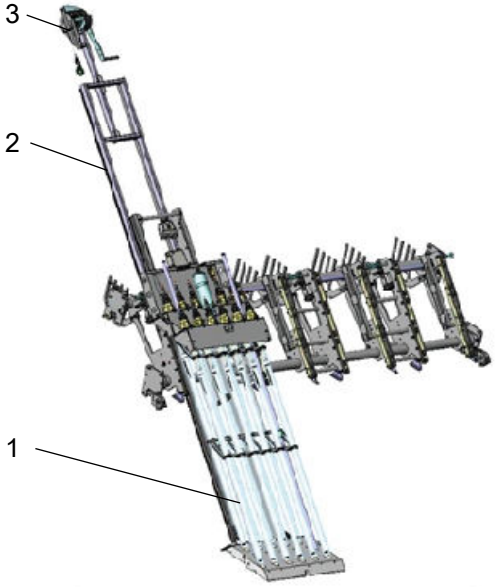
- The UV module consists of UV lamp modules that are arranged in two rows.
- The number of UV lamp modules in the UV module changes according to the configuration of the UV system.

Quantity of UV lamps in the UV module	Weight of the UV module
12	150 kg (331 lbs)
16	185 kg (408 lbs)
20	220 kg (485 lbs)

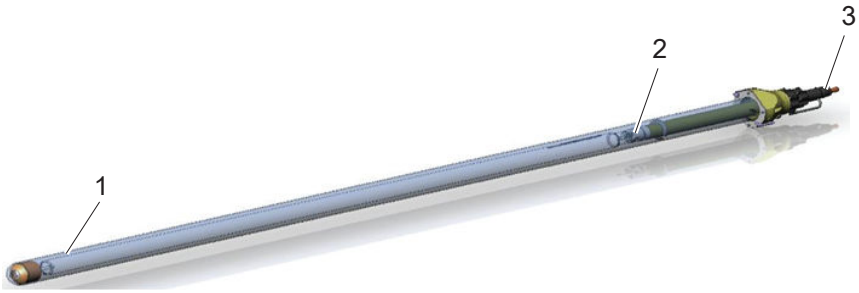
Module guide rack

- The module guide rack is a stainless steel structure that supports the UV modules in the UV channel.
- The rack has a lifting system so that the operator can lift an individual UV module.

  The following options are available:

Lifting system	Description
Electric	The electric lift consists of the following items: – A box that contains an electric motor and a gear system – Ground fault circuit interrupters  1. Ground fault circuit interrupters 2. Electric lift 3. Module guide rack
Manual	A mobile lifting structure is attached to the module guide rack. The mobile lifting structure consists of the following items: – Frame – Manual winch  1. UV module 2. Mobile lifting structure 3. Manual winch

UV lamp module

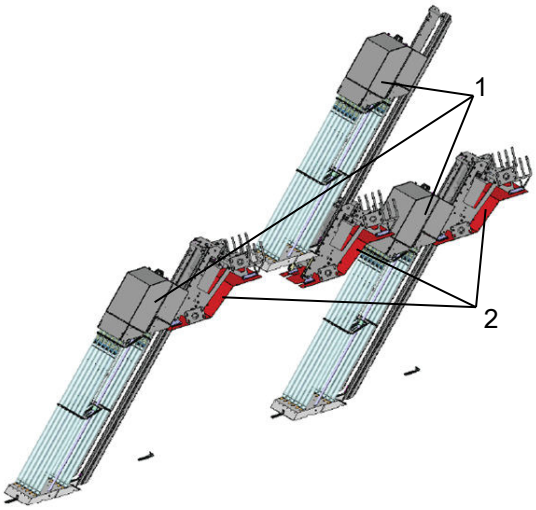


1. Quartz sleeve
2. UV lamp
3. Electrical connector

The UV lamp module gives UV light that disinfects the water.

Part	Description
Quartz sleeve	Protects the UV lamp
Electrical connector	Makes the electrical connection to the UV lamp

UV light shield



1. UV banks
2. UV light shields

UV light shields are installed between the UV banks. These UV light shields block the UV light when the UV channel covers are removed.

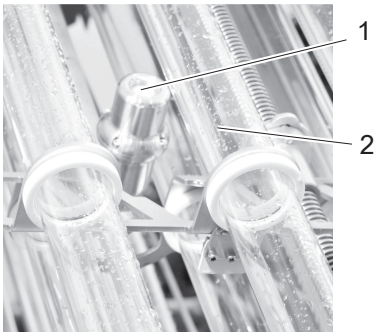
Interlock switch

Each UV module has an interlock switch which is a safety device.

When one of the following conditions occurs, the interlock switch automatically disconnects the power supply to the entire UV bank:

- The UV module cover is removed.
- The UV module is lifted.

UV sensor



1. UV sensor
2. UV lamp module

There is one UV sensor in one UV bank. The UV sensor measures the UV intensity of the UV lamps in the UV bank.

3.3 Automatic wiping system

The automatic wiping system automatically cleans the quartz sleeves of the UV modules.

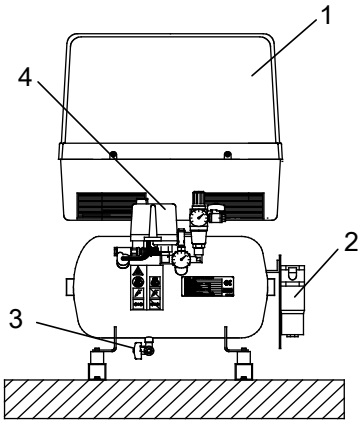
1. Wiper rings, quartz sleeves
2. Wiper blade
3. UV sensor

Part	Description
Wiper rings	The wiper rings move along the length of the quartz sleeves. There are two sets of wiper rings for one UV module.
Wiper blade	The wiper blade on the wiper cleans the UV sensor.

The following options are available:

Drive	Description
Pneumatic	A pneumatic actuator operates the wiper. An air compressor supplies compressed air to the pneumatic actuator. For more information, see *Air compressor* on page 19.
Electric	An electric motor operates the wiper.

Air compressor



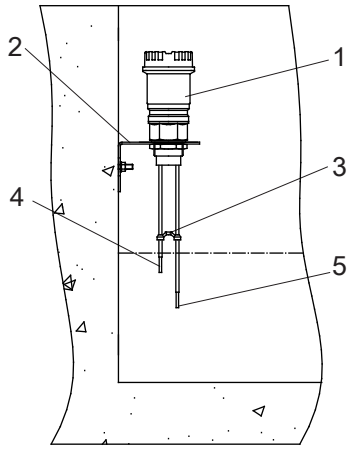
1. Motor
2. Pressure reducer with filter and automatic drain valve, 4 bar (58 psi)
3. Air receiver with manual drain valve, maximum 10 bar (145 psi)
4. Mains disconnector

The air compressor supplies compressed and filtered air to the pneumatic actuator of the automatic wiping system.

3.4 Level control

The level control system maintains and controls the water level in the UV channel.

3.4.1 Low-level probe

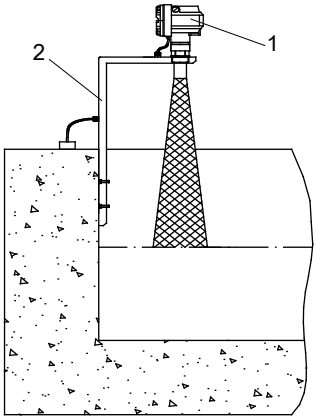


1. Probe housing
2. Bracket
3. Spacer
4. Probe rod, minimum level
5. Probe rod, ground level

The low-level probe is installed after the last UV bank of the UV channel. This low-level probe protects the UV lamps so that they do not overheat and turns off the UV system automatically under one of the following conditions:

- The water level is low in the UV channel.
- There is no water in the UV channel.

3.4.2 Ultrasonic level sensor



1. Ultrasonic level sensor
2. Bracket, stainless steel

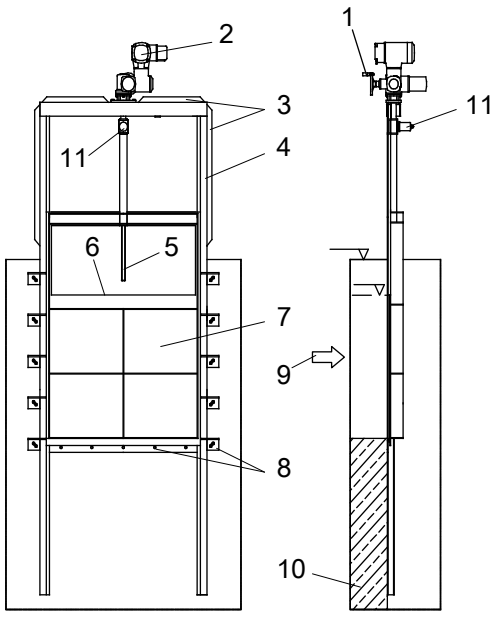
The ultrasonic level sensor is located before the first UV bank in the UV channel.

This ultrasonic level sensor sends a 4–20 mA feedback signal to operate the downward opening penstock (DOP) automatically.

Condition	DOP action
Water level > Target water level	Opens
Water level < Target water level	Closes

An extra ultrasonic level sensor measures the flow rate in each UV channel. The measured flow rate is used in the UV dose calculation.

3.4.3 Downward opening penstock

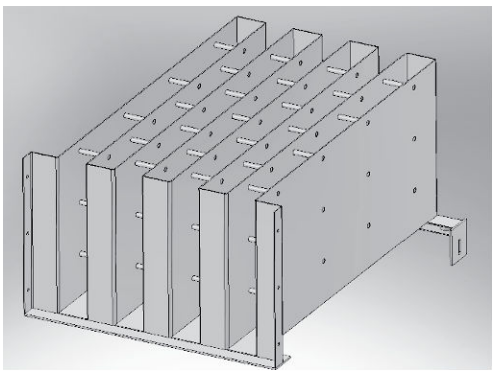


1. Handwheel
2. Electric actuator
3. Conduit
4. Fixed frame with gasket
5. Spindle
6. Overflow edge
7. Weir plate
8. Bracket
9. Concrete structure
10. Lubrication point
11. Spindle nut

The downward opening penstock (DOP) controls the water level in the UV channel. An electric actuator operates this DOP.

This DOP maintains a targeted effluent level of the water in the UV channel that is independent of the flow rate.

3.4.4 Finger weir

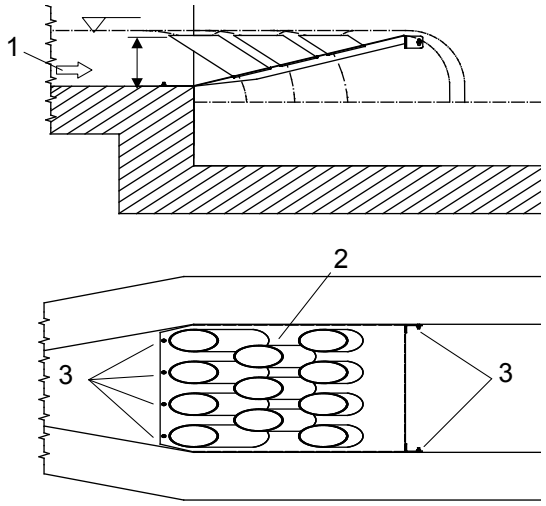


The finger weir consists of stainless steel plates. These plates force the water level in the UV channel to move up and flow over the edge of the weir.

The finger weir maintains the water level in the UV channel under the following conditions:

Condition	Water level
No water flow	Minimum
Water disinfection at peak flow rate	Maximum

3.4.5 Fixed pipe weir



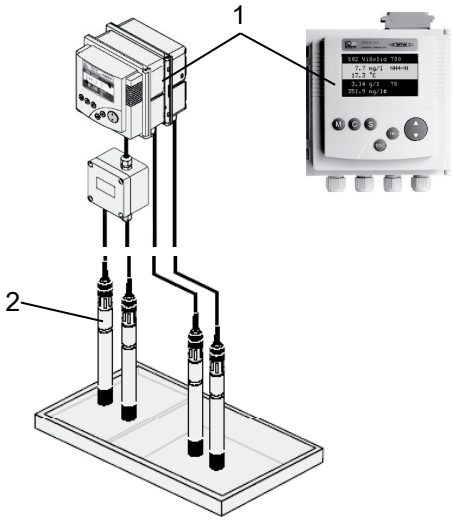
1. Water flow
2. Pipes, stainless steel
3. Anchor bolts, stainless steel

The fixed pipe weir consists of pipes. The orientation of the pipes forces the water level in the UV channel to move up and flow down through the pipes.

The finger weir maintains the water level in the UV channel under the following conditions:

Condition	Water level
No water flow	Minimum
Water disinfection at peak flow rate	Maximum

3.5 UV transmittance monitor



1. Controller, UV transmittance
2. Sensor, UV transmittance

The UV transmittance (UVT) monitor is installed at the inlet of the UV channel. This UVT monitor has the following purposes:

- Measures the UV transmittance of the water in the UV channel
- Sends a 4–20 mA signal that is relative to UVT

  EcoTouch displays the UVT as 0% to 100%. The measured value is used to calculate the following parameters:

Disinfection method	Parameters
PSS	The average UV intensity in the UV channel
NWRI and UVDGM	The relative UV lamp output (**S/So**) and **RED** in the UV channel

3.6 Channel cover

The channel covers are customer-supplied parts.

Requirements

- The material must be UV resistant.
- The channel cover must guarantee that no UV light can exit.
- The channel cover must be available to walk on.
- The channel cover must be protected against unauthorized opening.

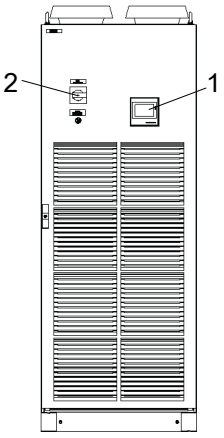
  The customer can install safety switches in the UV channel.

  These safety switches can be connected to the terminals safety switch channel cover to include them into the control of the UV system. For more information see the Wiring Diagram in the binder.

For more information, see the Duron Guideline Channel Cover.

3.7 Cabinets

3.7.1 Control cabinet

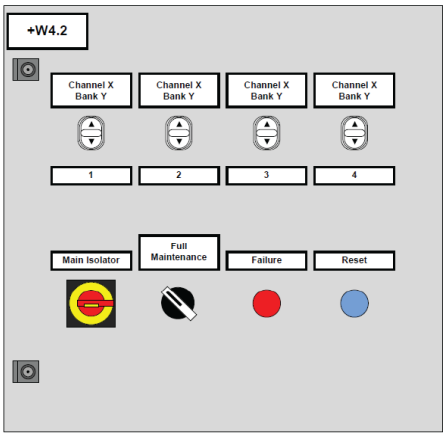


1. HMI
2. Main isolator

This cabinet consists of the following items:

- EcoTouch controller
- Control switches and instruments
- Electronic ballasts
- Power control for the electronic ballasts
- Wiper control
- Electrical terminals
- Monitoring and safety devices
- Air conditioner, optional

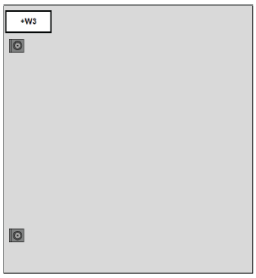
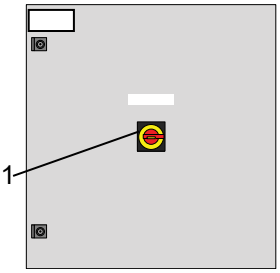
3.7.2 Lift control cabinet



This cabinet is located near each UV channel and includes electrical controls that operate the electric lift of the module guide rack.

3.7.3 Wiper control cabinet

This cabinet controls the automatic wiping system and has the following options:

Option	Description
Pneumatic	Contains the valves that distribute pressurized air to the pneumatic wipers 
Electric	Contains the controls that operate the electric wipers  1. Main isolator

4 Mechanical Installation

4.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

WARNING: Fall Hazard

Falls into the UV channel can cause serious injuries. Always keep the channel covers closed.

WARNING: Crush Hazard

The UV module can fall down or swing uncontrollably, and injure people or damage property. Never use a crane to lift the UV modules during strong winds.

WARNING: Crush Hazard

If the UV module is not attached safely, it can fall down. Set the safety lock pins in the locked position before the maintenance of the UV module starts. Install the safety block before the maintenance below the UV module starts. Do not remove the safety lock pins and safety block during maintenance.

WARNING: Crush Hazard

Always lift the unit by its designated lifting points.

Use suitable lifting equipment and ensure that the product is properly harnessed.

Wear personal protective equipment.

Stay clear of cables and suspended loads.

CAUTION: Cut Hazard

Steel sheets can have sharp edges. Wear protective gloves.

CAUTION: Entanglement Hazard

Loose clothing can entangle in the shaft that rotates. Do not wear loose clothing.

NOTICE:

Contamination by mild steel can cause dust and discolor the surface of stainless steel. This contamination can destroy the protective oxide layer and create pitting.

- Work that created particles of mild steel must be done away from surfaces that are made of stainless steel.
- The stainless steel parts must be covered correctly.

NOTICE:

The operator must not climb on the UV module or put anything on it.

NOTICE:

The operator must not climb on the UV channel cover or put anything on it.

NOTICE:

The operator must make sure that the cables are not damaged.

NOTICE:

UV lamps and quartz sleeves are fragile. These parts must be handled carefully.

NOTICE:

The UV system shall not be turned ON/OFF more than four times on an average 24 operating hour period.

Personal protective equipment

NOTICE:

The following personal protective equipment is needed:

- Protective gloves
- Safety footwear
- Safety helmet
- Safety goggles or face shield for UV protection

4.2 Necessary tools and equipment

- Service tools
- Drill bits:
  - 6 mm (0.23 in)
  - 8 mm (0.31 in)
  - 12 mm (0.47 in)
- Drilling template
- Measuring tape
- Spirit level
- Crane
- Lifting device
- Ladder

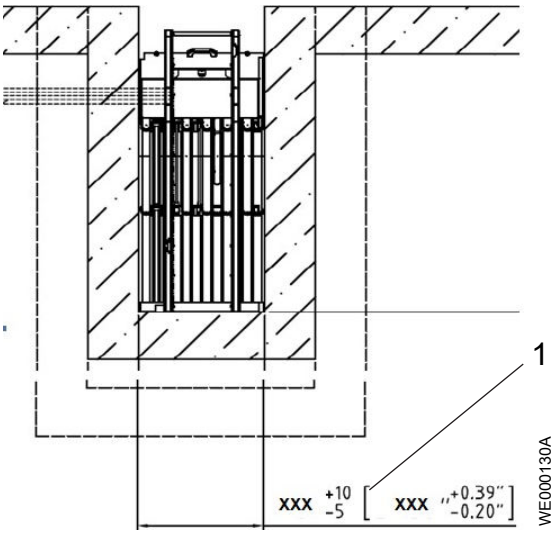
4.3 Requirements

- The site layout must be correct and all dimensions must be as specified in the drawings.

  For more information, see the General Arrangement Drawing, the Mounting Instruction UV Module, and the installation drawing in the binder.
- The site must be installed with the following customer-supplied components:
  - Flowmeter, optional

    In case the second ultrasonic level sensor for flow calculation is not included in the scope of supply.
  - Channel cover
  - Isolation gates for the UV channel inlet
- The UV channel dimensions must follow the local codes and regulations. For more information, see *UV channel* on page 27.

UV channel



1. Tolerance: +10 mm (0.39 in) to –5 mm (0.20 in)

- The UV channel design must follow these local codes and regulations:
  - DIN 1045

    The concrete quality must follow the C30/37 given in DIN 1045.
  - DIN 18202

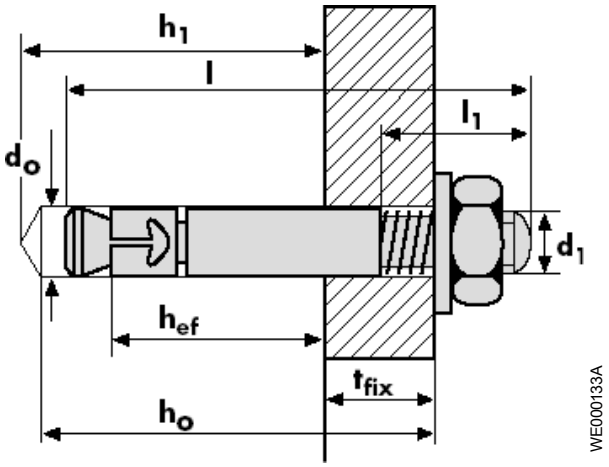
    The surface flatness must follow DIN 18202, table 3, line 7.
  - ACI 318
  - ENV 206
  - GBJ 10–89
- The face sides of the UV channel must follow these designs:
  - The deviation from vertical and surface finish must not be more than ± 5 mm (0.19 in).
  - There is no chamfer at the penstock or fixed weirs side.
- The UV channel width at the bottom must be smooth for the installation of the UV module.

For more information about the dimensions, see the project-specific drawings in the binder.

UV channel width, mm (inch)	UV channel depth, mm (inch)		Number of UV lamps for each UV bank	UV module for each UV bank
	Electrical wiper	Pneumatic wiper		
750 (29.53)	1900 (74.80)	2000 (78.74)	12	1 (12)
990 (38.98)			16	1 (16)
1230 (48.43)			20	1 (20)
1465 (57.68)			24	2 (12, 12)
1709 (67.28)			28	2 (12, 16)
1949 (76.73)			32	2 (16, 16)
2185 (86.02)			36	2 (16, 20)
2429 (95.63)			40	2 (20, 20)
2668 (105.04)			44	3 (12, 16, 16)
2905 (114.37)			48	3 (12, 16, 20)

4.4 Drill size and depth

The anchor bolts are supplied with the UV system. If the anchor bolts are not supplied, see the manufacturer instructions in the binder.



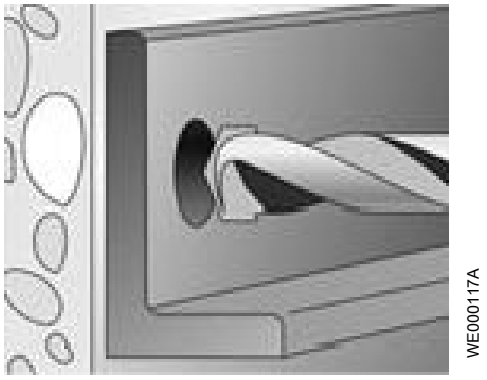
Drill diameter, do	Minimum drill depth, h1	Approximate length, l	Width across flats	Maximum torque	Thread, d1
mm (inch)				Nm (lbf·ft)	-
6 (0.23)	75 (2.95)	70 (2.75)	10 (0.39)	7.5 (5.53)	M6
8 (0.31)	80 (3.14)	75 (2.95)	13 (0.51)	20 (14.75)	M8
12 (0.47)	100 (3.93)	110 (4.33)	19 (0.74)	60 (44.25)	M12

4.4.1 Install the anchor bolt

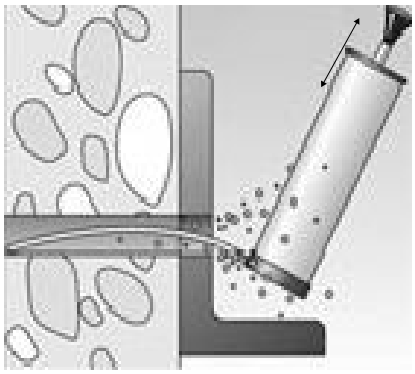
For more information, see the following documents in the binder:

- Installation instructions
- General Arrangement Drawing

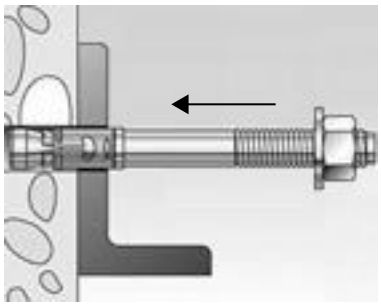
1. Drill a hole in the parts.
   For more information, see *Drill size and depth* on page 27.



2. Use compressed air to clean the hole.



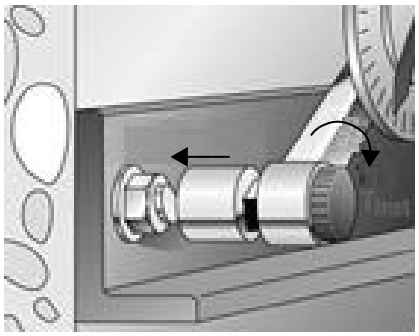
3. Insert the anchor bolt in the hole of the parts.



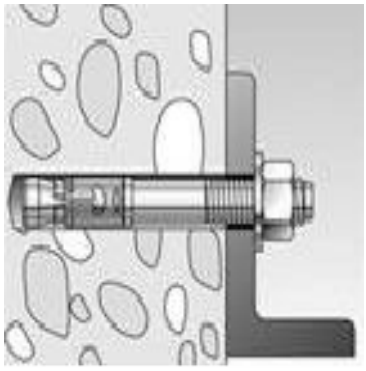
4. Attach the hexagon nut on the anchor bolt.

   The extension of the anchor bolt from the hexagon nut must be from 2 mm (0.078 in) to 3 mm (0.11 in).

5. Turn the anchor bolt in the hole.

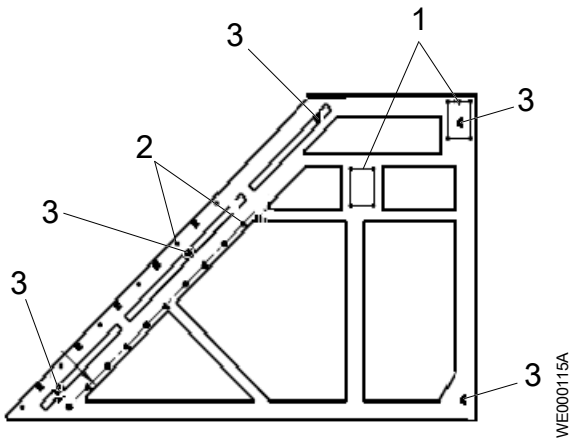


6. Use a wrench to tighten the hexagon nut.



4.5 Drilling: mounting plates and mixing rods

A drilling template is used to drill the holes in the UV channel at the identified position.

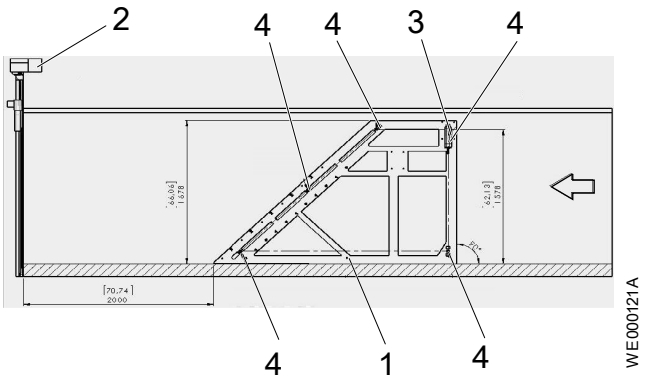


Hole position	Item	Number of holes
1	Mounting plates	8
2	Mixing rod for the UV channel walls, left and right	6
3	Drilling template	5

4.5.1 Attach the drilling template

Necessary items:

Item	Quantity
Drilling template	1
Anchor bolt, 6 mm (0.24 in)	5
Hexagon nut	5



1. Drilling template
2. Downward opening penstock
3. Drill
4. Holes for the drilling template

1. Locate the position of the last UV bank in the UV channel.

   For more information, see the General Arrangement Drawing in the binder.
2. Attach the drilling template flat against the UV channel wall.

   The drilling template must be aligned with the UV channel floor. For more information, see the UV channel tolerances in the binder.
3. Drill the holes on the UV channel wall.

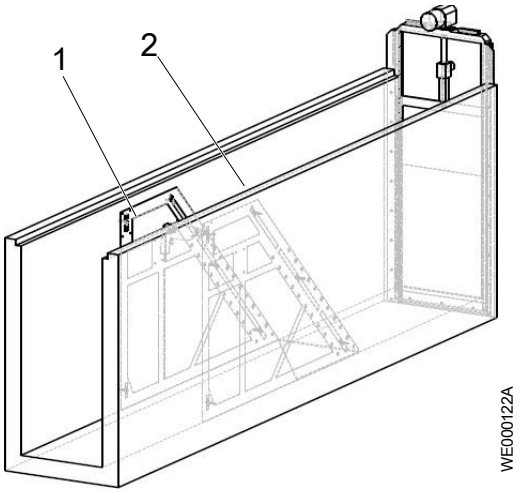
   The drill must be aligned at angle of 90° to the wall.

Hole dimension	Hole size, mm (inch)
Diameter	6 mm (0.23 in)

Hole dimension	Hole size, mm (inch)
Depth	65 mm (2.55 in)

4. Attach the anchor bolt and hexagon nut.

   For more information, see *Install the anchor bolt* on page 28.

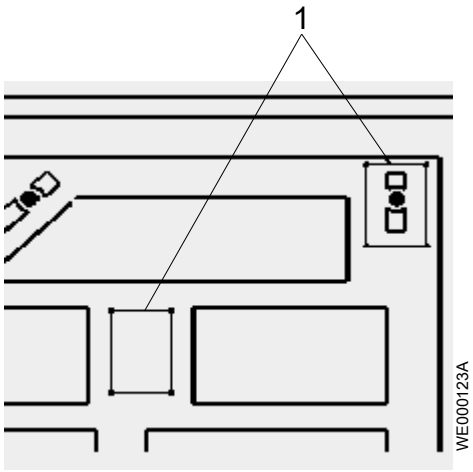


1. Drilling template
2. UV channel wall

4.5.2 Drill the holes for the mounting plate and the mixing rod

1. Attach the drilling template on one side of the UV channel.
2. Drill the holes for the mounting plate.

   There are total 16 drill holes are required in one UV bank.

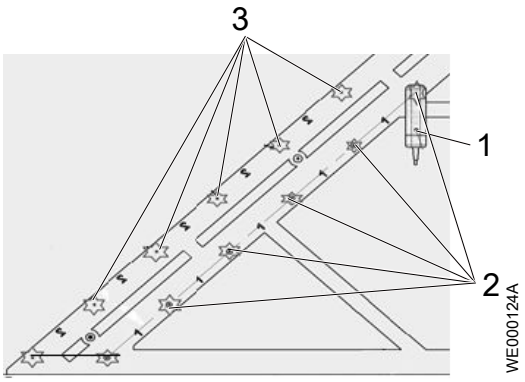


1. Mounting plate positions

3. Drill the holes for the mixing rod.

   There are total six drill holes are required on each side of the mixing rod.

   Do not drill both sets on the same side of the UV channel. For more information, see the installation drawing package in the binder.

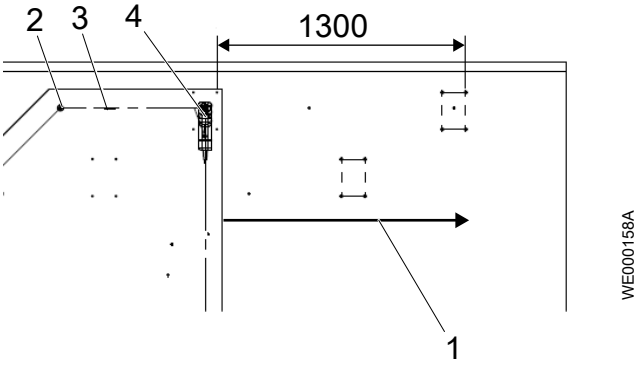


1. Drill
2. Hole position in flow direction, right side of the UV channel
3. Hole position in flow direction, left side of the UV channel

4. Remove the drilling template.

   For more information, see *Remove the drilling template* on page 32.

If there is more than one UV bank in a UV channel, then attach the drilling template at a distance of 1300 mm (51.18 in) in the opposite flow direction.



1. Opposite flow direction
2. Drill hole
3. Drilling template
4. Drill

Repeat this procedure for the other side of the UV channel, and for more than one UV channel in the UV system.

4.5.3 Remove the drilling template

1. Remove the hexagon nut from the anchor bolt.
2. Remove the drilling template from the UV channel wall.
3. Trim and smoothen the extra length of the anchor bolt.

4.6 Drilling: ultrasonic level sensor and low-level probe

Before the module guide rack is installed, all the holes for the low-level probe and ultrasonic level sensor must be drilled.

For more information, see the project-specific drawings in the binder:

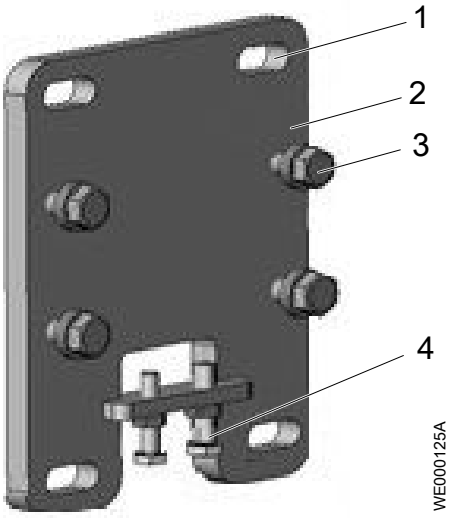
- General Arrangement Drawing
- Installation Ultrasonic Sensor
- Installation Low Level Probe

4.7 Install the mounting plate

Necessary items:

Item	Quantity
Mounting plate	4
Anchor bolts, 12 mm (0.47 in)	16
Hexagon nut	16

The holes positions on the UV bank must be correct. For more information, see the drawing U-85629 in the binder.

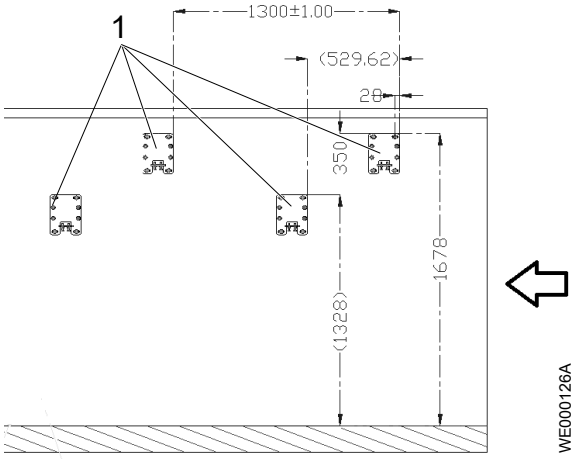


1. Hole for the anchor plate
2. Mounting plate
3. Screw
4. Adjusting screw

1. Enlarge the holes on the mounting plates.

   The size of the holes must be 12 mm (0.47 in).
2. Hold the mounting plate against the UV channel wall.

   The position and the orientation of the mounting plate must be correct. For more information, see the Mounting Instruction UV Module drawing in the binder.
3. Align the holes on the mounting plate with the holes on the UV channel wall.



1. Mounting plates

4. Attach the anchor bolts and hexagon nuts to the mounting plate.

   For more information, see *Install the anchor bolt* on page 28.

Repeat this procedure for the other mounting plates.

4.8 Install the mixing rod

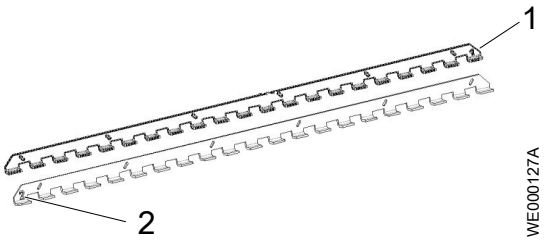
Necessary items:

Item	Quantity
Mixing rod	2
Anchor bolts, 6 mm (0.23 in)	12
Hexagon nut	12

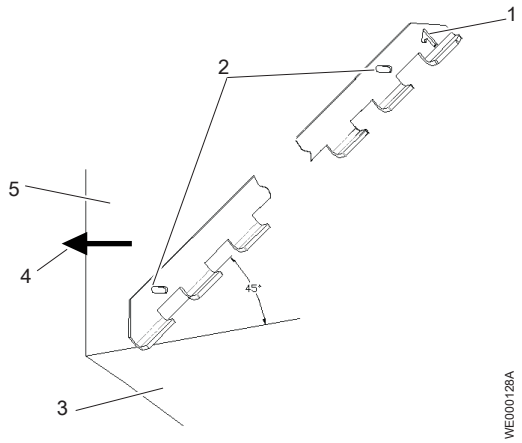
The holes position on the UV bank must be correct. For more information, see the drawing U-85629 in the binder.

This table shows the identification of the mixing rod:

Identification	Mixing rod position
1	Flow direction, right side
2	Flow direction, left side



1. Put the mixing rod against the UV channel wall.
2. Align the holes on the mixing rod with the holes on the UV channel wall.
   For more information, see the installation drawing in the binder.



1. Mixing rod, right side
2. Holes for the anchor bolts
3. UV channel floor
4. Flow direction
5. Flat side towards UV channel wall

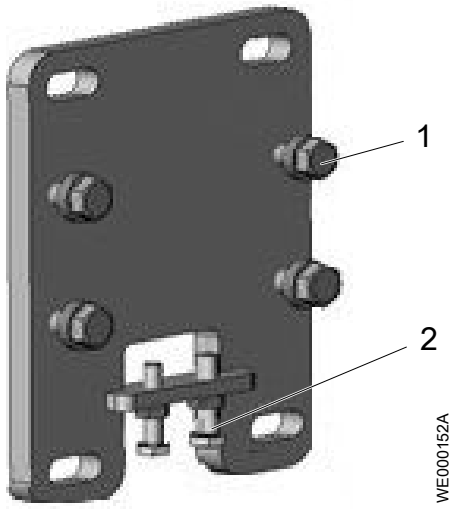
3. Attach the anchor bolts and the hexagon nuts on the mixing rod.
   For more information, see *Install the anchor bolt* on page 28.
   – Trim the extra threads of the anchor bolts.
     The threads of the anchor bolts must not extend beyond two to three threads.
4. Check the position of the left mixing rod.
5. If necessary, align the UV module and the components on the mixing rod.

4.9 Install the module guide rack

NOTICE:

The operator must make sure that the cables are not damaged during installation or maintenance.

1. The mounting bolts and washers must be removed from the mounting plates.



a. Bolts and washers
b. Adjusting screws

2. The adjusting screws of all the mounting plates must be on the same level.

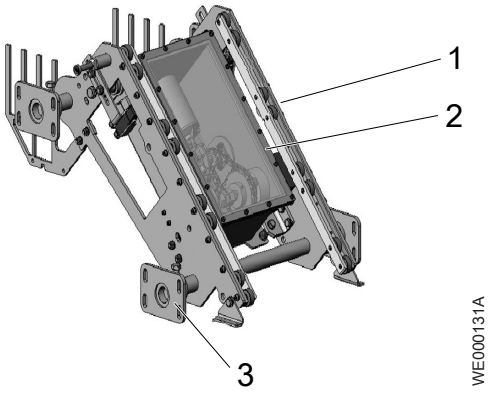


Figure 1: Electric lift assembly

1. Module guide rail
2. Electric lift assembly or manual lift assembly
3. Fixing plate

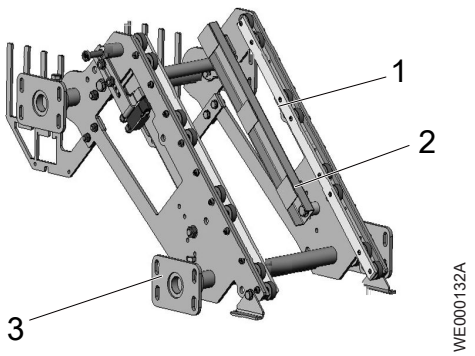
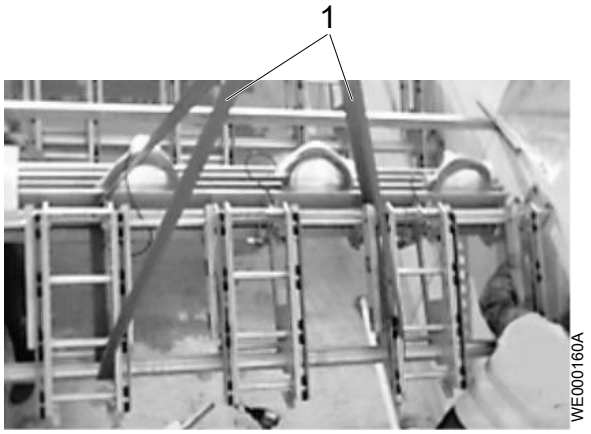


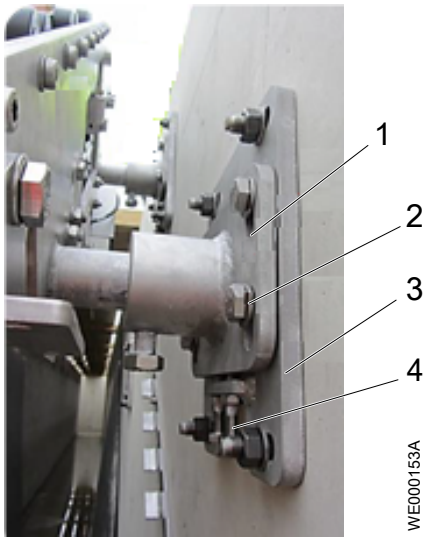
Figure 2: Manual lift assembly

1. Use the correct lifting equipment and slings to lower the module guide rack into the UV channel.



1. Slings

2. Align all the fixing plates on the module guide rack with the mounting plates on the UV channel wall.



1. Fixing plate
2. Bolt and washer
3. Mounting plate
4. Adjusting screw

3. Use a spirit level to check the level of the module guide rack.
4. If necessary, use adjusting screws to correct the level.
5. Align the position of the module guide rack from the center of the UV channel.

   If there is space between the mounting flange and the mounting plate, see the drawing of the operating tolerances of the UV channel.

   a) If necessary, add stainless steel shims to decrease the space.
   b) Use screws to tighten the fixing plate to the module guide rack.
6. Attach the bolts and the washers on the mounting plates.
7. Apply thread-locking fluid to the mounting plates.

Repeat this procedure for the other UV banks.

4.10 UV module installation

4.10.1 Prepare the UV module

The position of the UV module in the module guide rack is numbered. For more information, see the General Arrangement Drawing in the binder.

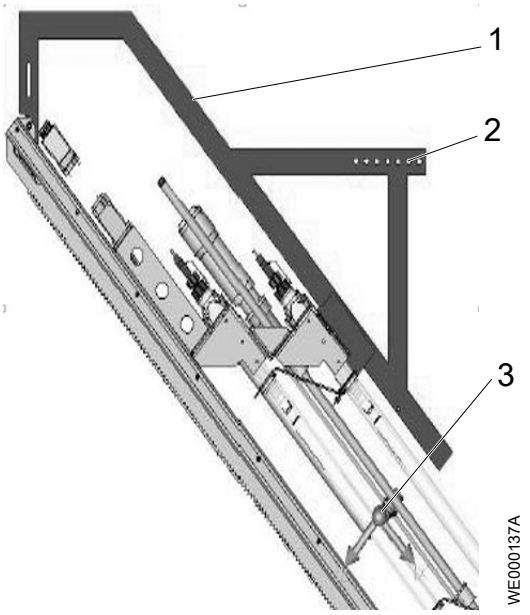
1. Remove the locking devices and packing material.
2. Locate UV module 1 and the position of UV module 1 on the module guide rack.
3. Remove the screws and the cover plate of the UV module.

4.10.2 Install the UV module

NOTICE:

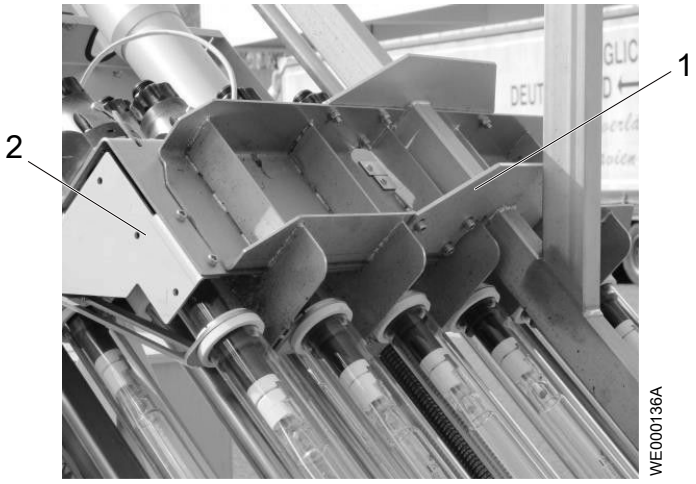
UV lamps and quartz sleeves are fragile. These parts must be handled carefully.

1. Attach a lifting device to the UV module.



1. Lifting device
2. Crane attachment point
3. Center of mass

a) Insert the lifting device on the quartz sleeve holder.



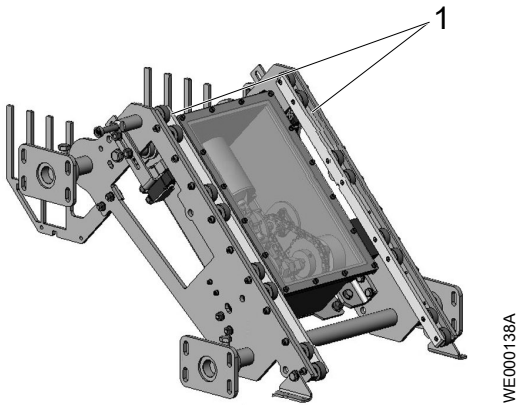
1. Lifting device
2. Quartz sleeve holder

b) Insert the hook of the lifting device to the other side of the circular bar.

1. Circular bar
2. Hook

c) Attach the crane hook at the crane attachment point.

2. Use the lifting device to lift the UV module at an angle of 45°.
3. Shift the UV module so that it is above the module guide rack.
4. Lower the UV module into the module guide rails of the module guide rack.



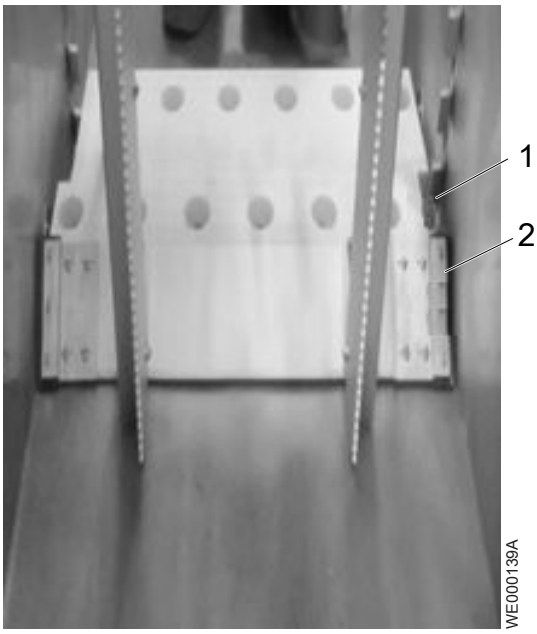
1. Module guide rails

5. Slowly lower the UV module into the UV channel.
6. Check the UV module position when the UV module is at the bottom of the UV channel.
7. Align the UV module with the module guide rack in the UV channel.
8. Install the centering angle bracket.
   For more information, see *Install the centering angle bracket* on page 39.
9. Adjust the sealing plate of the UV module.
   For more information, see *Adjust the sealing plate on the UV module* on page 38.
10. If the UV system has an electric lift box, then adjust the electric lift box.
    For more information, see *Adjust the electric lift box* on page 40.
11. Remove the following items from the UV module:
    1. Crane hook
    2. Lifting device

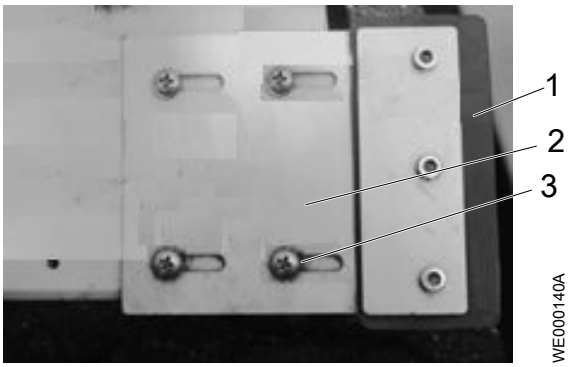
Repeat this procedure for all the UV modules.

4.10.3 Adjust the sealing plate on the UV module

Each UV module contains sealing plates that seal the adjacent UV module. After the UV module is put in the UV channel, the sealing plates must be adjusted.



1. Base plate of the UV module
2. Sealing plate



1. Rubber seal
2. Sealing plate
3. Cross screw

1. Loosen the cross screws.

   The cross screws must not be removed.
2. Move the position of the sealing plate so that it is nearer to the UV channel wall.
3. Check that there is no gap between the following items:
   - The rubber seal and the UV channel side wall
   - The rubber seal and the adjacent UV module, when the UV bank contains more than one UV module

   There must not be any force between the rubber seal and the UV channel wall or the adjacent UV module.
4. If necessary, enlarge the holes of the cross screws to remove the pressure on the sealing plate.
5. Tighten the cross screws.
6. Check that the sealing plate does not break when the UV module moves up and down.

Repeat this procedure for all the UV modules.

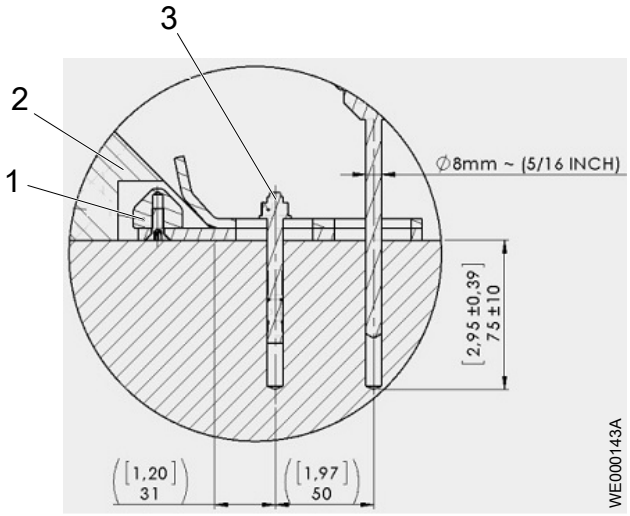
4.11 Install the centering angle bracket

Necessary item:

Item	Quantity
Angle bracket	One for each UV module

The UV module must be lowered completely into the UV channel.

The centering angle bracket stops the UV module at the bottom of the UV channel.



1. Guide pin
2. UV module
3. Anchor bolt

1. Locate the guide pin of each UV module.
2. Drill two holes on the UV channel floor.

Hole dimension	Hole size, mm (inch)
Diameter	8 (0.31)
Depth	75 (2.95)

1. Angle bracket

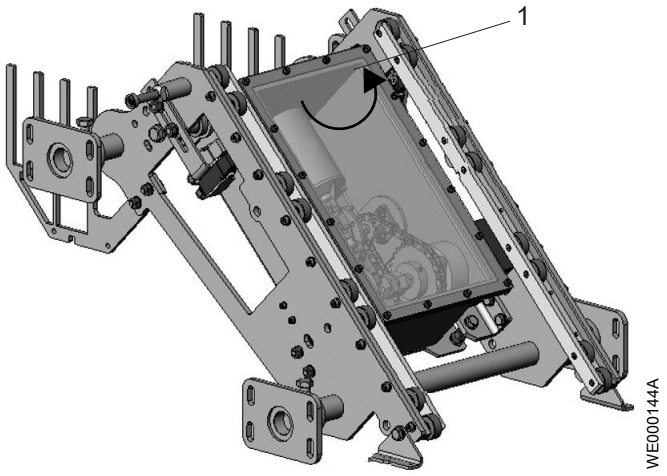
3. Use the anchor bolts to attach the angle bracket to the UV channel floor.

   The first anchor bolts must be put approximately 31 mm (1.22 in) from the UV module edge on the UV channel floor.

4.12 Adjust the electric lift box

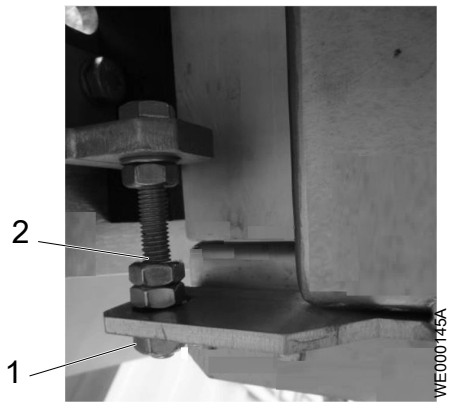
Before the electric lift box is adjusted, the UV module must be lowered into the UV channel.

The drive mechanism box for the electric lift is located inside the UV module. The electric lift box is pivot-mounted at the top of the UV module.



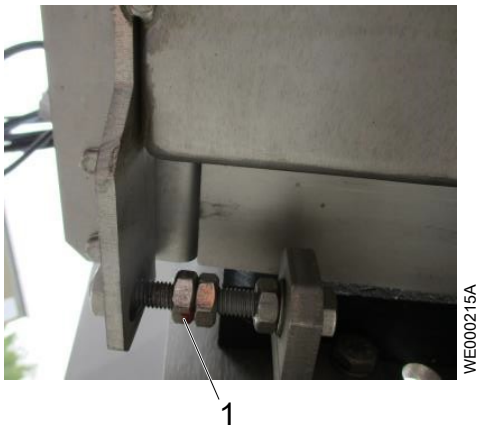
1. Electric lift box

1. Check the nut when the electric lift box is at the lower setting of the adjusting screw.



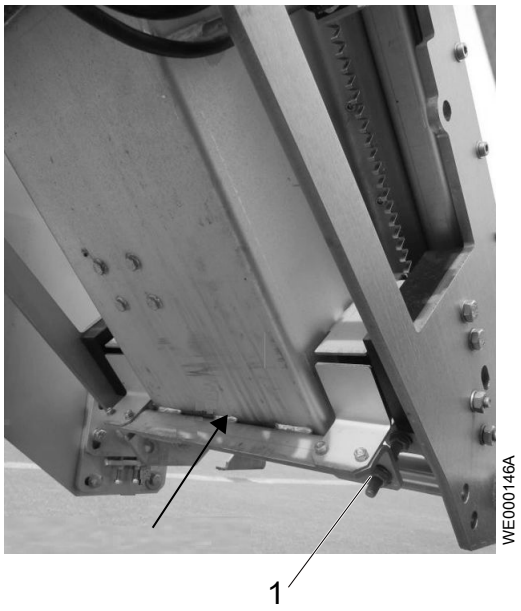
1. Nut
2. Adjusting screw

2. If the nuts are loosened, then move them to the upper position.



1. Nut

3. Manually lift the electric lift box from the bottom.



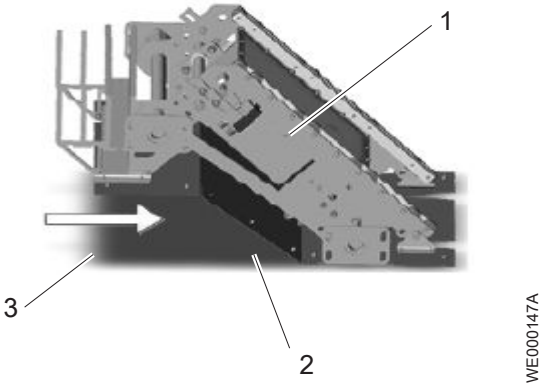
1. Nut

4. Lock the electric lift box at each side with the nuts.
5. Use the nuts to tighten the adjusting screws.

4.13 Install the UV light shield

Necessary items:

Item	Quantity for each UV module
UV light shield	1
Movable plate	6
Screws	8



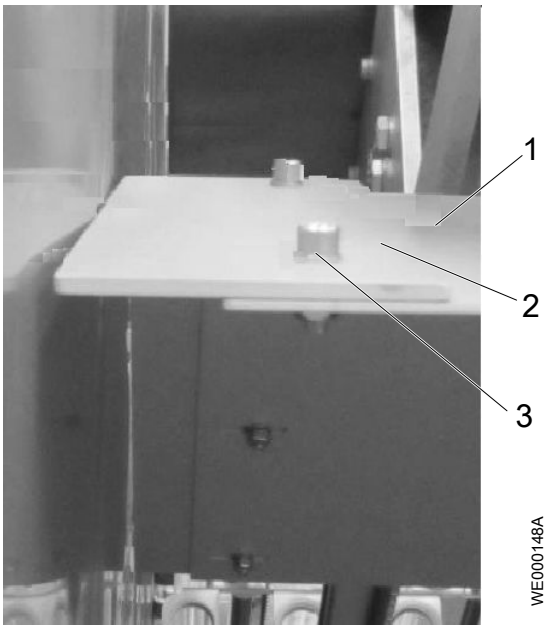
1. Module guide rack
2. UV light shield
3. Flow direction

1. Attach the UV light shield under the UV module.

   The movable plates must be installed upside.
2. Align the UV light shield with the brackets of the UV light shield at the UV module.
3. Use screws to fix the UV light shield on the brackets.
4. Slide the movable plate back and forth until there is no gap between the UV light shield and the UV channel wall.

4.13.1 Adjust the UV light shield at the UV module

After adjustment of the electric box, the UV light shield must be adjusted.



1. UV light shield
2. Movable plate
3. Screw

1. Loosen the screws.
2. Slide the movable plate back and forth until there is no gap between the UV light shield and the UV channel wall.
3. Tighten the screws.

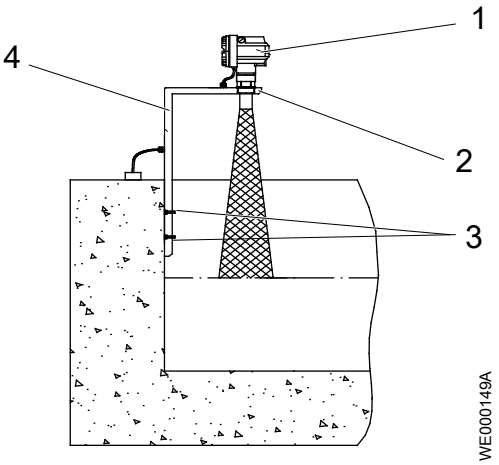
4.14 Install the ultrasonic level sensor

Before the UV module is lowered into the UV channel, the ultrasonic level sensor must be installed.

For more information about the number and position of the ultrasonic level sensor, see these documents in the binder:

- General Arrangement Drawing
- Order Specification
- Endress+ Hauser for Prosonic FMU 40

The ultrasonic level sensors are not needed on the UV systems with fixed weirs.



1. Ultrasonic level sensor
2. Nut
3. Anchor bolts
4. Angle bracket

1. Put the angle bracket against the UV channel wall.

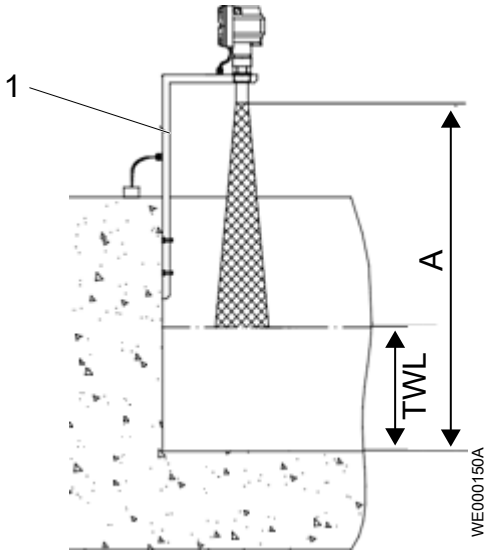
   For more information, see the installation drawing in the binder.
2. Identify the location of the drill holes.
3. Drill the holes for the anchor bolts.
4. Use anchor bolts to attach the angle bracket.

   For more information, see the installation drawing and *Install the anchor bolt* on page 28.
5. Install the ultrasonic level sensor through the hole in the angle bracket.
6. Tighten the nut.
7. Connect the electrical cables.
8. Check that the electrical isolation between the control signals and the power supply is correct.
9. Carefully clean the surface of the ultrasonic level sensor.

4.14.1 Adjust the ultrasonic level sensor

For more information, see the following documents in the binder:

- Vendor manual, Endress + Hauser ultrasonic level measurement FMU40
- General Arrangement Drawing
- Installation drawing, U-88216



1. Angle bracket

1. Turn on the HMI of the ultrasonic level sensor.

   For more information see the Vendor manual, Endress + Hauser in the binder.
2. Select these parameters on the HMI of the ultrasonic level sensor:
   a) Language
   b) Measurement in **mm** or **inch**
   c) **Basic setup** > **tank shape** > **no ceiling**
3. Measure A.

   A= Distance between the UV sensor head and the bottom of the UV channel
4. Calculate B.

   B = TWL + blocking distance

   For more information, see the General Arrangement Drawing in the binder.
5. Change the following parameters:
   – The **full calibration** according to B
   – **No. of decimals** to **no decimals** on the function screen
6. Fill the UV channel with water.

   The water level can be simulated. The distance value between the UV sensor and bottom of the UV channel must be recorded.
   a) Use the measuring tape to measure the water level.
   b) Compare this level with the water level that the HMI shows.
   c) Repeat *step 1* to *step 2* with minimum two different levels.
7. If the water level measurement differs between the HMI and measuring tape, then repeat *step 1* to *step 6*.
8. In **Safety settings** on HMI of the ultrasonic level sensor, change the following sensor parameters:

Output on alarm	**User-specific**
	2.40 mA
Output on echo loss	**Alarm**
Delay time	5 s

Dimension	**Measurement**
UV sensor head to channel bottom	4 mA

Dimension	Measurement
UV channel bottom and TWL + 100 mm (3.93 inch)	20 mA

9. Check that the water level values are the same on these user interfaces:
   – HMI of the ultrasonic level sensor
   – EcoTouch

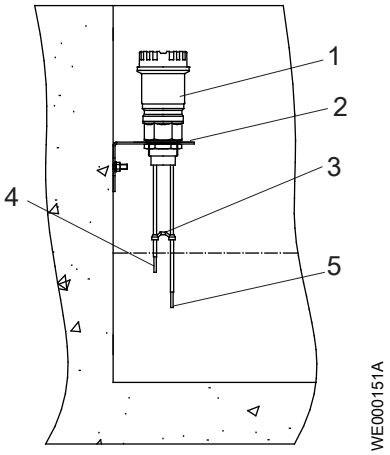
4.15 Install the low-level probe

Before the UV module is lowered into the UV channel, the low-level probe must be installed.

For more information, see the following documents in the binder:

- Vendor manual, Endress + Hauser for Liquipoint FTW32
- General Arrangement Drawing

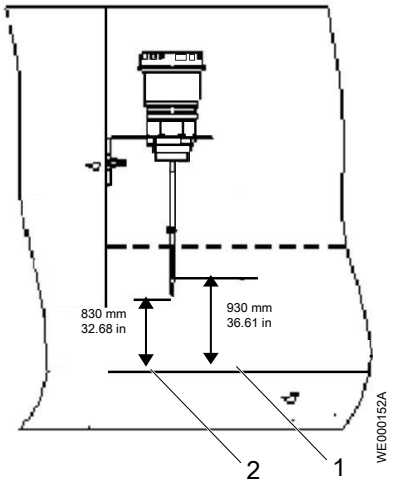
1. Put the angle bracket against the UV channel wall.
   For more information, see the installation drawing in the binder.
2. Identify the location of the drill holes.
   a) Drill the holes for the anchor bolts.
   b) Use anchor bolts to attach the angle bracket.
   For more information, see the installation drawing and *Install the anchor bolt* on page 28.
3. Assemble the sensor housing.



1. Sensor housing
2. Bracket
3. Spacer
4. Sensor rod, minimum level
5. Sensor rod, ground level

   a) Attach the sensor assembly through the large hole in the bracket.
   b) Attach the lock nut.
   c) Cut the probe rods to the correct lengths.

Probe rod	Length
Ground level	830 mm (32.08 in)
Minimum level	930 mm (36.61 in)



1. 930 mm (36.61 in)
2. 830 mm (32.08 in)

4. Connect the electrical cables.

   For more information, see the single line and electrical diagrams in the binder.

Repeat this procedure for all the UV channels in the UV system.

4.15.1 Adjust the low-level probe

After the electrical cables are connected, the low-level probe must be adjusted.

1. Check the function of the low-level probe by using a water container.
2. Measure the distance from the end of the probe rod to the bottom of the UV channel.

   For more information, see the installation drawing in the binder.
3. If small adjustment is necessary, loosen the bracket nuts.

   The nuts must not be removed.
4. Slide the bracket and probe assembly up or down until the distance is correct.

   The bracket must be in the horizontal position.
5. Tighten the bracket nuts.

4.16 Installation of optional equipment

4.16.1 Fixed weir

Necessary items:

- Fixed weir assembly
- Silicone gel

For more information, see the General Arrangement Drawing and installation drawing of the fixed weir in the binder.

4.16.2 Downward opening penstock

For more information, see the General Arrangement Drawing and vendor installation documentation in the binder.

4.16.3 Air compressor

The air compressor is used for the pneumatic wiper only. For more information, see the General Arrangement Drawing and the compressor instructions in the binder.

4.16.4 UV transmittance monitor

For more information, see the manufacturer instructions in the operation and maintenance manual in the binder.

5 Electrical Installation

5.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.

DANGER: Electrical Hazard

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must perform all electrical work. Comply with all local codes and regulations.

WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.

WARNING: Crush Hazard

Always lift the unit by its designated lifting points.

Use suitable lifting equipment and ensure that the product is properly harnessed.

Wear personal protective equipment.

Stay clear of cables and suspended loads.

CAUTION: Electrical Hazard

Prevent cables from becoming sharply bent or damaged.

NOTICE:

The operator must make sure that the power supply for the UV system follows the specifications in the technical data.

NOTICE:

The operator must make sure that the cables are not damaged.

Personal protective equipment

NOTICE:

The following personal protective equipment is needed:

- Protective gloves
- Safety footwear
- Safety helmet
- Safety goggles or face shield for UV protection

5.2 Necessary tools and equipment

- Electrical tools
- Drill bits
- Spirit level
- Measuring tape
- Crane

  For more information about the load requirements of cabinets, see the packing list in the binder.

5.3 Cabinet installation

5.3.1 Requirements

Location

- All cabinets must follow the local codes and regulations.
- The electrical conduit and cable routing must follow the project-specific drawing in the binder.

Cabinets

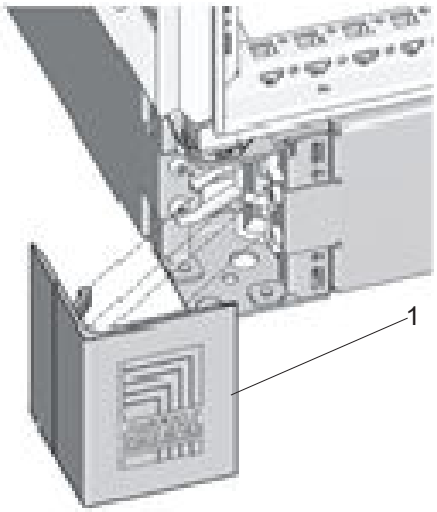
- The cabinets must be protected from direct sunlight.
- The ambient temperature must follow the design specifications that are on the data plate.
- The mains supply must follow the requirements of the UV system. For more information, see the data plate or the Wiring Diagram in the binder.
- Fuses must be installed in the power supply of the cabinet on site.
- All the fuses, circuit breakers, and ground fault circuit interrupters must have the correct ratings, and follow the local regulations.
- The electrical load resistance for all the analog input and output signals of 4-20 mA must be below 500 ohms.
- The cabinets must have the following clearance. For more information, see the project-specific drawing in the binder.

Description	Clearance, cm (inch)
Airflow around ventilation areas	≥ 30 (11.8)
Rear side of the cabinets	100 (39.37), recommended

5.3.2 Install the control cabinet

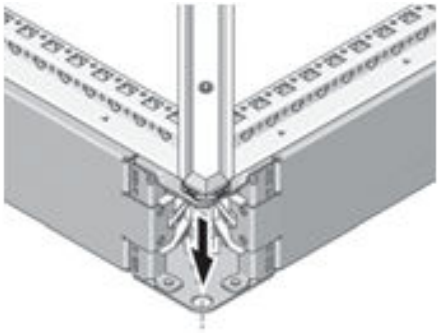
1. Put the control cabinet on the floor.

   For more information, see the General Arrangement Drawing in the binder.
2. Remove the cover plates from the corners of the control cabinet base.



1. Cover plate

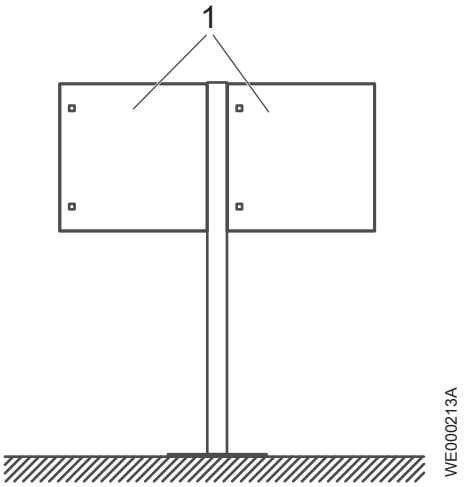
3. Identify the hole positions on the floor.



4. Remove the control cabinet.
5. Drill holes on the identified positions.
   The holes must be cleaned.
6. Insert the anchor bolts.
7. Put back the control cabinet in the correct position.
8. Tighten the nuts and washers on the anchor bolts.
9. Attach the cover plates.

5.3.3 Install the wiper control cabinet or the lift control cabinet

1. Put the stand and the control cabinets on the floor.
   For more information, see the General Arrangement Drawing in the binder.



1. Control cabinet

2. Identify the hole positions on the floor.

   For more information, see the Installation Wiper Control Cabinet drawing or Installation Lift Control Cabinet drawing in the binder.
3. Remove the stand and the control cabinets.
4. Drill the holes on the identified positions.

   The holes must be cleaned.
5. Insert anchor bolts.
6. Put back the stand and control cabinets on the floor.
7. Tighten the nuts and washers on the anchor bolts.

5.4 Cable installation

5.4.1 Requirements

The following documentations must be available:

- General Arrangement Drawing
- External Cabinet Layout
- Wiring Diagram
- Cable List Overview

Cables

- The cable specifications and installation of potential equalization must follow the local rules and regulations.
- All cables, except main power supply cables, must be screened.

  The screens must be connected to the screen clamps to make sure electrical continuity.
- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The cables must not be rolled into coils but it is possible to arrange the cables in large S-shaped loops.
- The minimum bend radius of a cable must be ten times more than the cable diameter.
- The cable ends must have end sleeves.

Power cables

- If the power cable is pulled loose, then the ground (earth) conductor must be the last conductor to come loose from its terminal.
- The ground (earth) conductor must be longer than the phase conductors.
- The cable diameter of the power cables and all related wires must follow the Wiring Diagram.

UV lamp cables

- The UV lamp cables must be of a minimum length. For more information, see *Install the cables* on page 52.
- The UV lamp cables that connect to the control cabinet must be shortened at the ends.

Signal cables

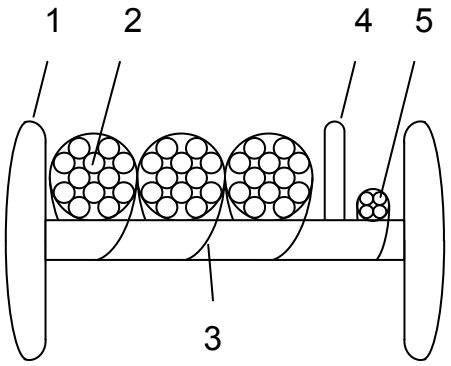
The signal cables must be installed separately from these cables:

- Power cables
- UV lamp cables

Cable duct and conduit

System	Maximum number of UV lamp cables	Diameter, mm (inch)
ELR60, 600 W	9	75 (3)
	18	100 (4)

Cable tray



1. Cable tray
2. UV lamp cables
3. Cable tie
4. Separation plate
5. Sensor cables

For more information, see the project-specific Wiring Diagram and Cable List Overview in the binder.

5.4.2 Install the cables

Before the cables are installed, the electrical category documents in the binder must be read and understood.

- The ground wire must be as short as possible.
- The UV lamp cables must be installed separately from the other cables and must have the following minimum length:

UV lamps	Minimum cable length
ELR60	8 m (26.25 ft)

If power generators are used for the main power supply, the operator must contact the manufacturer for approval.

1. Install the following items between the cabinets and the UV bank:
   - Ground wire
   - UV lamp cables

For more information, see the installation sheets that are located inside the cabinet.

- UV sensor cables

2. If applicable, install the cables that connect the following cabinets to the control cabinet and the UV bank:
   - Wiper control cabinet
   - Lift control cabinet
3. If applicable, connect all the external cables to the customer terminals.

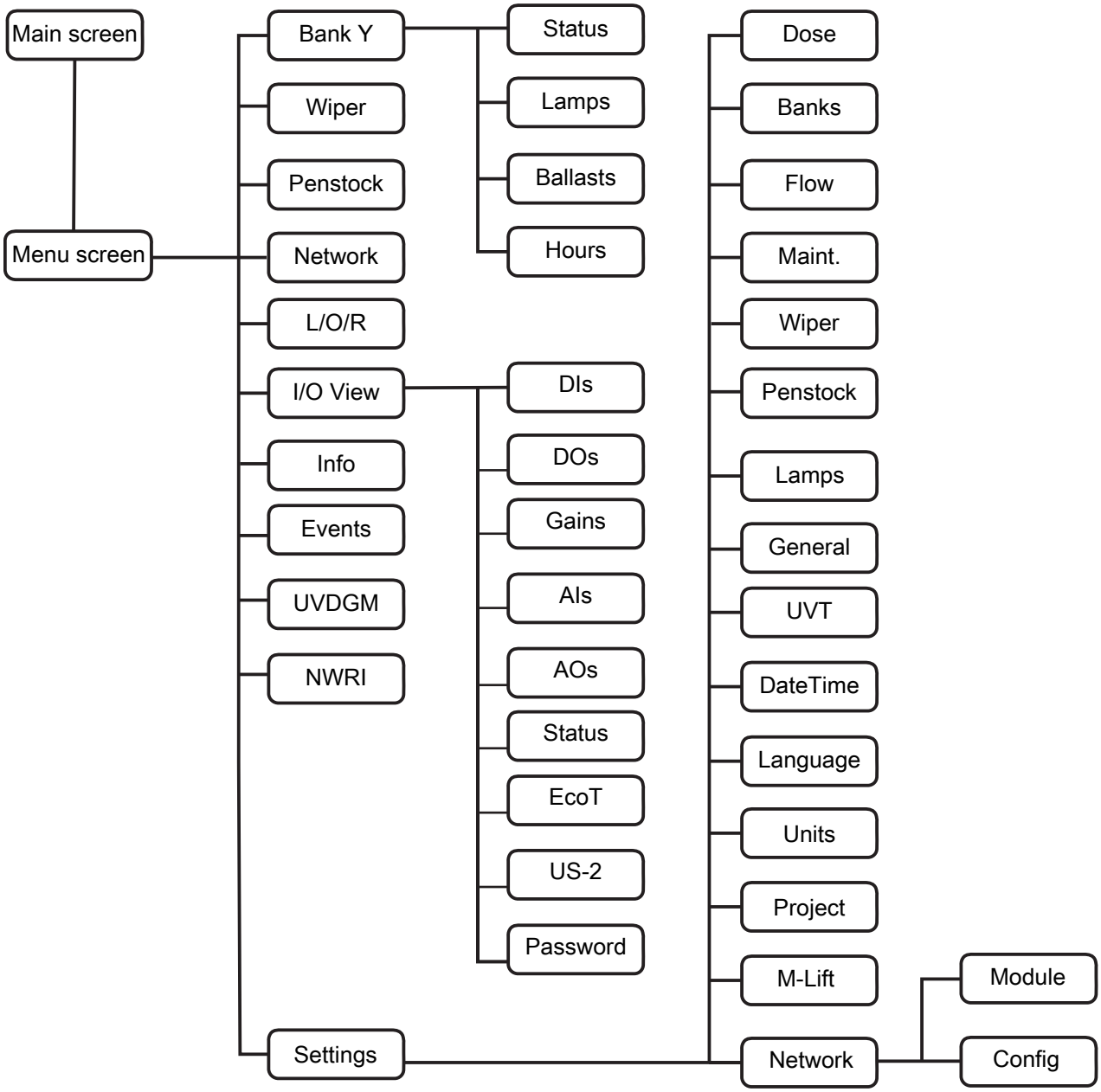
   For more information, see the Wiring Diagram in the binder.
4. Connect the related cables to the following items:
   - Low-level sensor
   - Ultrasonic level sensor, optional
   - Downward opening penstock (DOP), optional
   - Flowmeter and signal cables, optional
   - UV transmittance (UVT) monitor, optional
5. Check that all the terminals and connections are connected correctly.
6. Connect the power supply cable.

Before the UV system is turned on for the first time, record the results of the following values:

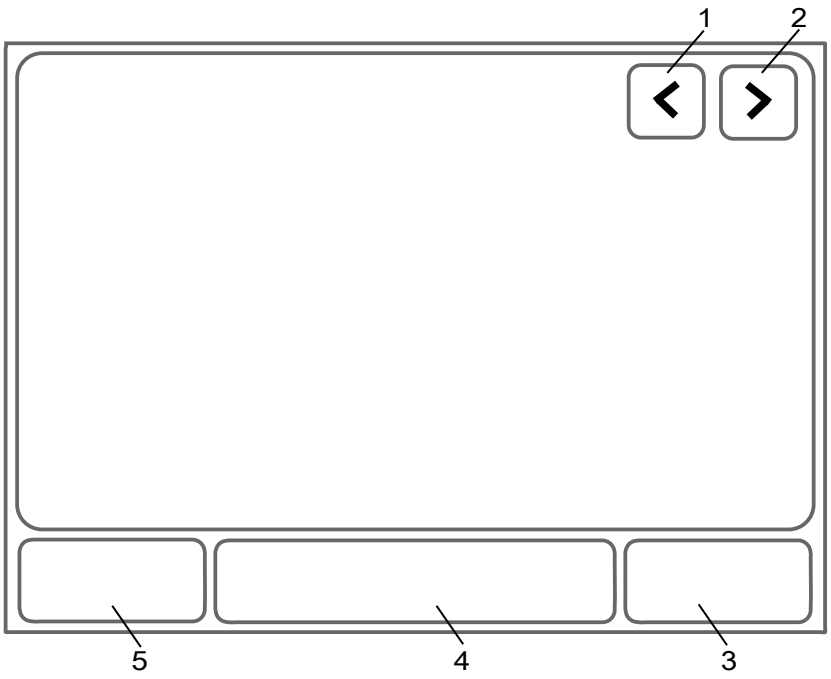
- Insulation measurements
- Loop resistances
- Incoming voltages

6 User Interface

6.1 User interface overview



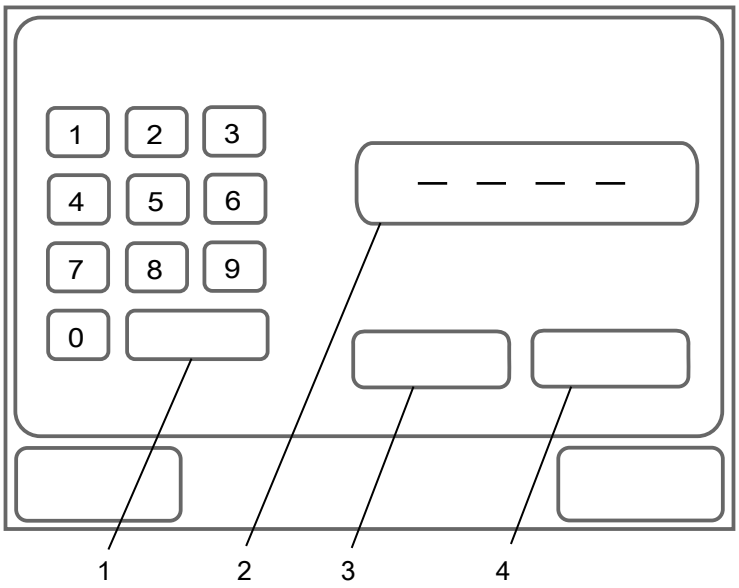
6.2 User interface navigation



Position	Button	Description
1		Opens the previous page
2		Opens the next page
3	**Main**	Opens the **Main** screen For more information, see *The Main screen* on page 57.
4	Status message	Shows the following information about the UV system: • Event messages • Alarms • Warnings
5	**Menu**	Opens the **Menu** screen For more information, see *The Main Status Menu screen* on page 58.
	Bank A	Opens the **Bank A Menu** screen
	Bank B	Opens the **Bank B Menu** screen
	Bank C	Opens the **Bank C Menu** screen
	Bank D	Opens the **Bank D Menu** screen
		Opens the previous menu
	Reset	Resets the alarms, warnings, and event messages

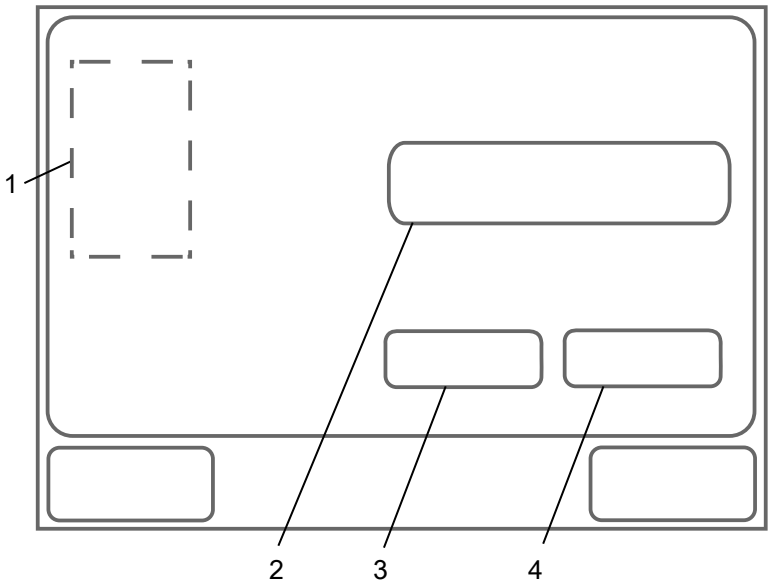
6.3 The Input screen

Numerical entry



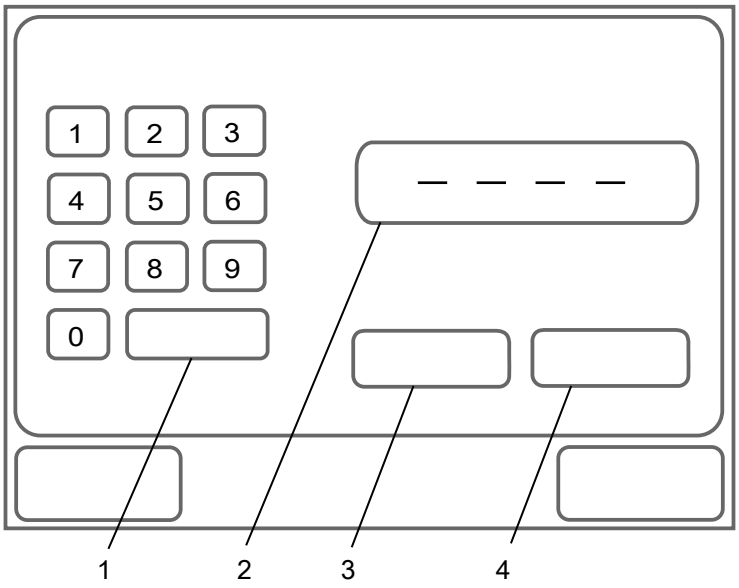
Position	Button	Description
1	**Delete**	Deletes the entered character
2	Display	Shows the entered value
3	**Cancel**	Cancels the entered value
4	**Enter**	Confirms the entered value

Parameter settings



Position	Button	Description
1	Parameters settings	Allows the selection of settings
2	Display	Shows the selected setting
3	**Cancel**	Cancels the selected setting
4	**Enter**	Confirms the selected setting

6.4 The Password screen



Position	Button	Description
1	**Delete**	Deletes the entered character
2	Display	Shows the entered password
3	**Cancel**	Cancels the entered password
4	**Enter**	Confirms the entered password

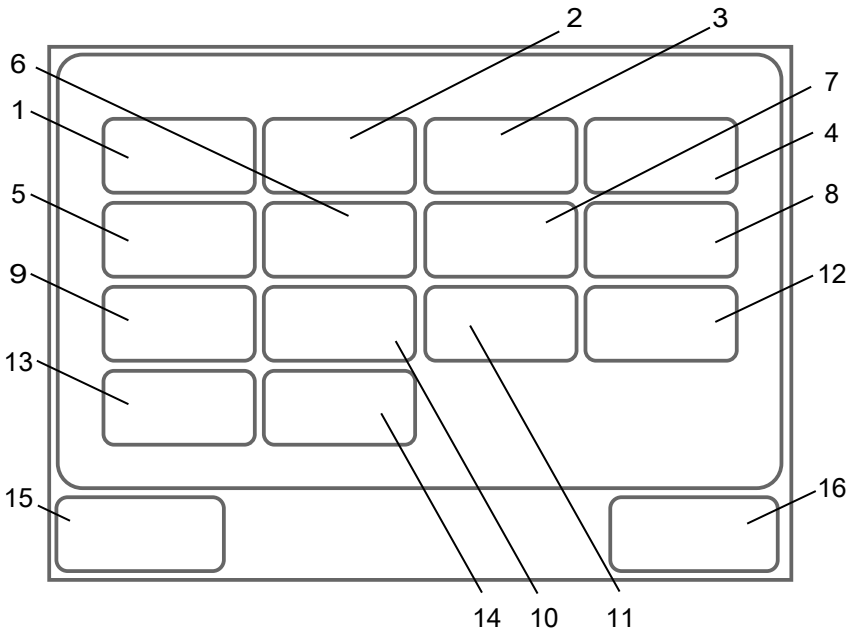
Accessibility

- The password, 4488 must be entered to access the screens that are password-protected.
- This password is not applicable for the project setting screens.

6.5 The Main screen

Parameter	Description	Unit
Dose or **RED**	Shows the disinfection value for one of the following disinfection methods: • PSS • NWRI • UVDGM	**mJ/cm²**
Target Dose or **Target RED**	Shows the target disinfection value for one of the following disinfection methods: • PSS • NWRI • UVDGM	**mJ/cm²**
Flow	Shows the flow rate value	• **m³/h** • **gpm**
UVT	Shows the UV transmittance value	%
Water Level	Shows the water level in the UV channel This parameter is applicable to the outlet penstock.	• **mm** • **Inches**
Time at 100%	Shows the time that the UV lamps continue to operate at 100% power This parameter is applicable when the dose control is on.	**Minutes**

6.6 The Main Status Menu screen

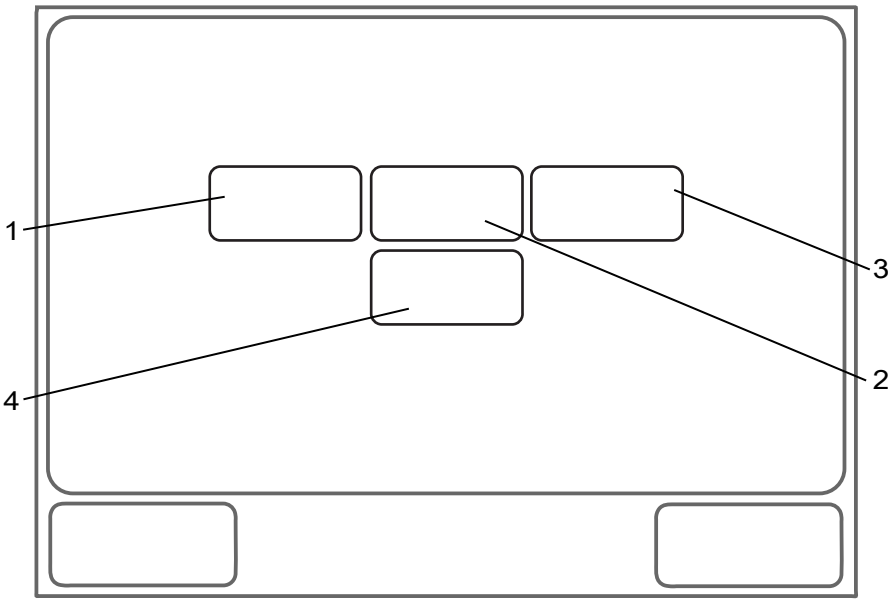


Position	Button	Screen type	Description	Remark
1	**Bank A**	Status	Opens the **Bank A Menu** screen that shows the parameters of the UV bank For more information, see *The Bank A Menu screen* on page 59.	-
2	**Bank B**		Opens the **Bank B Menu** screen that shows the parameters of the UV bank	This button is enabled when two UV banks are installed.
3	**Bank C**		Opens the **Bank C Menu** screen that shows the parameters of the UV bank	This button is enabled when three UV banks are installed.
4	**Bank D**		Opens the **Bank D Menu** screen that shows the parameters of the UV bank	This button is enabled when four UV banks are installed.
5	**Wiper**		Opens the screen that shows the status of the pneumatic or the electric wiper For more information, see *The Pneumatic Wiper Status screen* on page 61 or *The Electric Wiper Status screen* on page 62.	This button is applicable to the automatic wiping system.
6	**Penstock**		Opens the **Outlet Penstock Status** screen that shows the parameters of the outlet penstock For more information, see *The Outlet Penstock Status screen* on page 62.	This button is applicable to the outlet penstock.
7	**Network**		Opens the **Network** status screen	-

Position	Button	Screen type	Description	Remark
8	**L/O/R**	Setting	Opens the **Remote Mode Selection** screen that allows the user to select the operation mode of the UV system For more information, see *The Remote Mode Selection screen* on page 63.	-
9	**Settings**		Opens the **Settings Menu** screen that allows the user to set the UV system parameters For more information, see *The Settings Menu screen* on page 64.	-
10	**I/O View**	Status	Opens the **I/O View Menu** screen that allows the user to access the I/O parameters For more information, see *The I/O View Menu screen* on page 63.	-
11	**Info**		Opens the **Info** screen that shows the software and hardware information of the UV system For more information, see *The Info screen* on page 64.	-
12	**Events**		Opens the **Events** screen that shows the following information: • A list of the last 70 warnings, alarms, and events • The date and timestamp of the start and the end times	-
13	**UVDGM**		Opens **UVDGM Validation Info** screen that shows the parameters of the UVDGM disinfection method For more information, see *The UVDGM Validation Info or NWRI Validation Info screen* on page 64.	This button is enabled when the disinfection method is UVDGM.
14	**NWRI**		Opens **NWRI Validation Info** screen that shows the parameters of the NWRI disinfection method For more information, see *The UVDGM Validation Info or NWRI Validation Info screen* on page 64.	This button is enabled when the disinfection method is NWRI.
15	**Reset**	Function	Resets the alarms	-
16	**Main**	Status	Opens the **Main** screen For more information, see *The Main screen* on page 57.	-

6.6.1 The Bank A Menu screen

The screens are similar for **Bank B**, **Bank C**, and **Bank D**.

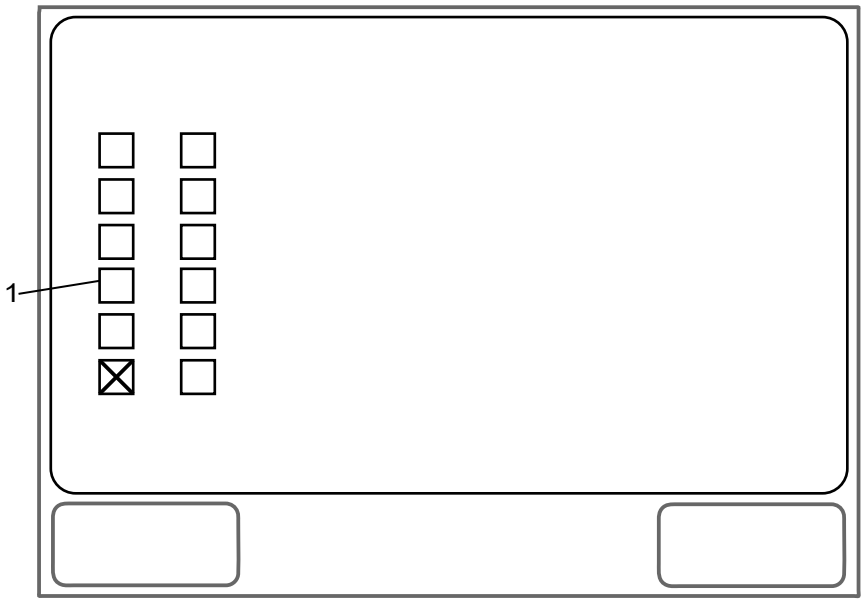


Position	Button	Description
1	**Status**	Opens the **Bank A** screen that shows the status of the UV bank
2	**Lamps**	Opens the **Lamps Status** screen that shows the operation status of the UV lamps
3	**Ballasts**	Opens the screen that shows the status of the electronic ballasts This screen is accessible to Wedeco only.
4	**Hours**	Opens the **Bank A: Lamp Hours** screen that shows the operating hours of the UV lamps

The Bank A status screen

Parameter	Description	Unit
Bank A	Shows the status of the UV bank • **Duty** = Always on • **Assist** = Operates according to the dose-pacing algorithm when the dose control is on • **Standby** = Turns on when the **Duty** or the **Assist** UV banks are not available • **Off** = Turned off	-
Dose or **RED**	Shows the disinfection value of the UV bank for one of the following disinfection methods: • PSS • NWRI • UVDGM	**mJ/cm²**
Intensity	Shows the UV intensity value of the UV bank	**W/m²**
Power	Shows the UV lamp power	%
Bank ON/OFF Cycles	Shows the number of times that the UV bank is turned on and off	-
Bank Operating Hours	Shows the total hours of the UV bank operation	**h**
Time at 100%	Shows the time that the UV lamps continue to operate at 100% power This parameter is applicable when the dose control is on.	**Minutes**

The Lamps Status screen



Position	Description
1	Shows the status of each UV lamp • White = Turned on • Blue = Turned off • X = Failed

The Bank A: Lamp Hours screen

Parameter	Description
State On/Off Cy Hours	Shows the following parameter information: • The status of the UV lamps in the UV bank – White = Turned on – Blue = Turned off – X = Failed • The number of times the UV lamps are turned on and off • The total hours of the UV lamp operation

6.6.2 The Pneumatic Wiper Status screen

This screen is applicable to the pneumatic wiper.

Parameter	Description	
Wiping Interval	Shows the time in minutes of the wiping interval	
Wipe	Shows the ongoing wipe in the wiping cycles	
Wiping	Shows the operational status of the wiper • White = In operation • Blue = Not in operation	
Rest End	Shows the position of the wiper	
		Start
		End
		Between the start and the end
# of Wipes	Shows the wiping cycles that are completed for the UV bank	

6.6.3 The Electric Wiper Status screen

This screen is applicable to the electric wiper.

Parameter	Description
Wiping Interval	Shows the time in minutes of the interval between the wiping operations
Wiping	Shows the operational status of the wiper • White = In operation • Blue = Not in operation
Wiper failure	Shows the status of the wiper • White = Okay • Blue = Failed
# of Wipes	Shows the wiping cycles that are completed for the UV module

6.6.4 The Outlet Penstock Status screen

This screen is applicable to the outlet penstock.

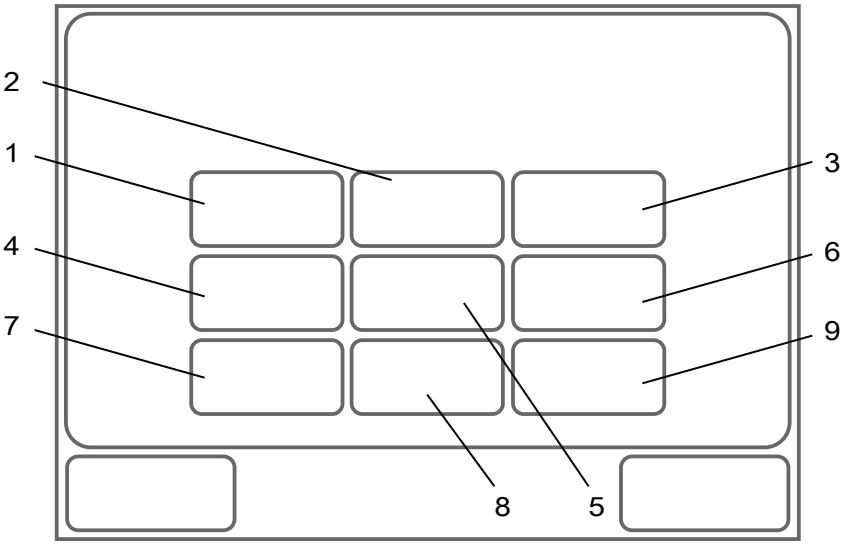
Parameter	Description
Water Level	Shows the water level in the UV channel
Penstock Status	Shows one of the following statuses: • **Completely Opened** = The outlet penstock is open. • **Opening** = The outlet penstock continues to open. • **Stopped** = The outlet penstock has stopped. • **Closing** = The outlet penstock continues to close. • **Completely closed** = The outlet penstock is closed.
Setpoints	Shows the values that are set for the water level in the UV channel The outlet penstock operates automatically according to the following setpoints: • **Water level very high** = The outlet penstock continues to open until the water level reaches the **Water Level High** setpoint. • **Water Level High** = The outlet penstock continues to open in the pulsed mode until the water level reaches the **Water level** setpoint. • **Water level** = The outlet penstock stays open according to the target water level. • **Water level low** = The outlet penstock continues to close in the pulsed mode until the water level reaches the **Water level** setpoint. • **Water level very low** = The outlet penstock continues to close until the water level reaches the **Water level low** setpoint.

6.6.5 The Remote Mode Selection screen

Parameter	Description
Current Mode	Shows the operation mode of the UV system • **Local** = The UV system is controlled from the HMI. • **Off** = The UV system is turned off. • **Remote** = The UV system is controlled remotely from the central control room. A tap on the mode changes the operation mode. For more information, see *The Input screen* on page 56.

6.6.6 The I/O View Menu screen

This screen is password-protected. For more information, see *The Password screen* on page 57.



Position	Button	Description
1	**DIs**	Opens the **Digital Inputs** screen that shows the monitoring parameters of the digital inputs
2	**DOs**	Opens the **Digital Outputs** screen that shows the monitoring parameters of the digital outputs
3	**Gains**	Opens the **UV Sensor Gain Outputs** screen that shows UV sensor information
4	**AIs**	Opens the **Analog Inputs** screen that shows the monitoring parameters of the analog inputs
5	**AOs**	Opens the **Analog Outputs** screen that shows the monitoring parameters of the analog outputs
6	**Status**	Opens the **TerD Comm. Status** screen
7	**EcoT**	Opens the **EcoTouch Internal** settings screen This screen is accessible to Wedeco only.
8	**US-2**	Opens the **Water Level US-2** screen This button is enabled when the flow source is from the ultrasonic sensor or outlet penstock. For more information, see *The US-2 screen* on page 64.
9	**Password**	Opens the **Password** setup screen

The US-2 screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description
Water Level US-2	Shows the water level in the UV channel The flow source is from one of the following systems: • Fixed weir with ultrasonic sensor • Penstock with ultrasonic sensor
Penstock Position	Shows the position of the outlet penstock This parameter is applicable to the outlet penstock.

6.6.7 The Info screen

Parameter	Description
Product type and disinfection method	Shows the Duron model and one of the following disinfection methods that is used: • PSS • UVDGM • NWRI
Hardware	Shows the version of the EcoTouch controller
Firmware Version:	Shows the version of the firmware
Text File Version:	Shows the version of the text file
Date/Time	Shows the following information: • Date = Day, month, and year • Time = Hours and minutes

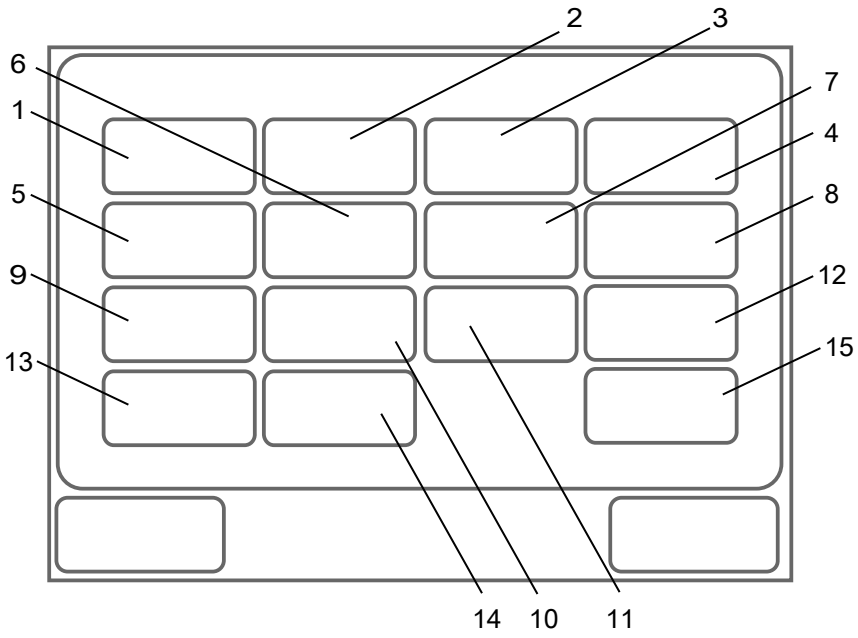
6.6.8 The UVDGM Validation Info or NWRI Validation Info screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameters	Description
UVT % **S/So** **RED** **F/L**	Shows the validation limits of the parameters The **S/So** parameter is applicable for the UVDGM disinfection method. The **RED** column shows the value that is used in the **RED** equation.
UV Intensity **S/So** **Sp** **CAF** **Low UV**	Shows the setpoints of the parameters

6.7 The Settings Menu screen

This screen is password-protected. For more information, see *The Password screen* on page 57.



Position	Button	Description
1	**Dose** or **RED**	Opens the **Dose Control** or the **RED Control** settings screen For more information, see *The Dose Control or RED Control screen* on page 66.
2	**Banks**	Opens the **Bank Control** settings screen For more information, see *The Bank Control screen* on page 67.
3	**Flow**	Opens the **Flow Settings** screen For more information, see *The Flow Settings screen* on page 68.
4	**Maint.**	Opens the **Maintenance Mode** settings screen For more information, see *The Maintenance Mode screen* on page 68.
5	**Wiper**	Opens the **Wiper Settings** screen for the pneumatic or the electric wiper For more information, see *The Pneumatic or Electric Wiper Settings screen* on page 69.
6	**Penstock**	Opens the **Penstock Settings** screen For more information, see *The Penstock Settings screen* on page 69.
7	**Lamps**	Opens the **Lamp Hours Management** settings screen For more information, see *The Lamp Hours Management screen* on page 70.
8	**General**	Opens the **General Settings** screen For more information, see *The General Settings screen* on page 71.
9	**UVT**	Opens the **UVT Settings** screen For more information, see *The UVT Settings screen* on page 71.
10	**Date/Time**	Opens the **Date and Time Settings** screen For more information, see *The Date/Time screen* on page 72.
11	**Language**	Opens the **Language Selection** settings screen For more information, see *The Language Selection screen* on page 72.
12	**Units**	Opens the **Units of Measurement** settings screen For more information, see *The Units of Measurement screen* on page 72.

Position	Button	Description
13	**Project**	Opens the **Project Setup** screen This screen is not accessible to the operator.
14	**Network**	Opens the **Network Setup Menu** settings screen For more information, see *The Network Configuration screen* on page 73.
15	**M-Lift**	Opens the module lift screen For more information, see *The module lift screen* on page 74.

6.7.1 The Dose Control or RED Control screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Dose Control or **RED Control**	• **ON** = The dose control is on. The UV lamps power changes according to the dose-pacing algorithm. • **OFF** = The dose control is off. The UV lamps stay at 100% power.	**ON** **OFF**	-	-
Min. Design Dose or **Min. Design RED**	Sets the value for the minimum design dose	1–200	-	**mJ/cm²**
Offset Dose or **Offset RED**	Sets the safety factor that is added to the minimum design dose This parameter keeps the target UV dose more than the minimum design dose. **Target Dose** = (**Offset Dose** or **Offset RED**) + (**Min. Design Dose** or **Min. Design RED**)	0–50	-	**mJ/cm²**
Deadband	Sets the deadband value for the target UV dose When the calculated UV dose is in the deadband limits, the UV lamps power does not change automatically.	0.1–9.9	1.0	**mJ/cm²**
Dose Low Alarm Delay or **RED Low Alarm Delay**	Sets the time delay for the alarm for low UV dose	30–900	300	**s**
DL (Sensitivity)	Sets the organism sensitivity This parameter is applicable for the UVDGM disinfection method.	-	See the order specification.	-
Bank, Min Time ON	Sets the minimum time that the UV bank must stay on This parameter is used under the following conditions: • The dose control is on. • The UV system is in the **Duty–Assist** configuration.	1–6	6	**h**

Parameter	Description	Selection	Default	Unit
Next Bank ON Power	Sets the power limit of the UV bank When the UV bank power is more than this value, the next UV bank turns on automatically. This parameter is used under the following conditions: • The dose control is on. • The UV system is in the **Duty–Assist** configuration.	60–100	90	%
Bank OFF Overdose	Sets the overdose limit of the UV channel When the UV dose of the UV channel reaches this limit, the next UV bank turns off automatically. This parameter is used under the following conditions: • The dose control is on. • The UV system is in the **Duty–Assist** configuration.	0–50	5	%
Min. Full Power Time	Sets the minimum time that a UV bank must operate at 100% power This parameter is used when the dose control is on.	1–120	30	**Minutes**
Min. Time Min. Power	Sets the minimum time that a UV bank must operate at minimum power After the time expires, the UV bank turns off automatically. This parameter is used under the following conditions: • The dose control is on. • The UV system is in the **Duty–Assist** configuration.	1–30	10	**Minutes**
Power Ramp Rate	Sets the rate that the UV lamps power must increase or decrease This parameter is used when the dose control is on.	1–60	15	**s**

6.7.2 The Bank Control screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
Bank A Control **Bank B Control** **Bank C Control** **Bank D Control**	Allows the operator to set the status for the UV bank: • **Duty** = The UV bank is always on. • **Assist** = The UV bank operates according to the dose-pacing algorithm when the dose control is on. • **Standby** = The UV banks turns on when the **Duty** or the **Assist** UV banks are not available. For UV systems with one UV bank, the status is set to **Duty**.	**Duty** **Assist** **Standby**

6.7.3 The Flow Settings screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Flow 20 mA =	Sets the flow rate value for the 20 mA signal This parameter is applicable when the flow source is from the ultrasonic sensor.	-	-	**m³/h** **gpm** **m³/s** **MGD**
Min. Design Flow	Sets the value for the minimum design flow If the design flow is lower than this value, an alarm is triggered.	-	See the order specification.	**m³/h** **gpm** **m³/s** **MGD**
Max. Design Flow	Sets the value for the maximum design flow If the design flow is higher than this value, an alarm is triggered.	-	See the order specification.	**m³/h** **gpm** **m³/s** **MGD**
Flow Low Alarm Delay	This setting is accessible to Wedeco only.	0–120	-	**Minutes**
Flow High Alarm Delay	This setting is accessible to Wedeco only.	0–60	-	**Minutes**

6.7.4 The Maintenance Mode screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Maintenance Mode	Allows the operator to turn on the maintenance mode When this mode is turned on, the following alarms for the applicable UV bank are suppressed: • **UV Dose Low** • **Bank A: UV Intensity Low**	**ON** **OFF**	**OFF**	-

Parameter	Description	Selection	Default	Unit
Bank A	Allows the operator to turn on or turn off the applicable UV bank manually when the maintenance mode is on	**ON** **OFF**	**OFF**	-
Bank B				
Bank C				
Bank D				
Lamp Power	Allows the operator to adjust the UV bank power manually when the maintenance mode is on	50–100	100	%

6.7.5 The Pneumatic or Electric Wiper Settings screen

This screen is password-protected and is applicable to the automatic wiping system. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Wiper Enabled	Allows the operator to turn on or turn off automatic wiping	**ON** **OFF**	-	-
Wipes Per Cycle	Sets the number of wipes for a wiping cycle This parameter is applicable to the pneumatic wiper.	2–5	2	-
Wiping Interval	Sets the time period between two wiping cycles	1–120	60	**Minutes**
Time Next Bank Wipe	Sets the time period between the wiping cycle of one UV bank and the next UV bank This parameter is applicable to the pneumatic wiper.	15–900	15	**Seconds**
Wiper failure delay	Sets the time delay for the following alarms for the applicable UV bank: • **Wiper A: Return Failure** • **Wiper A: Forwards Failure** This parameter is applicable to the pneumatic wiper.	15–120	30	**Seconds**
Alarm delay, low air pressure	Sets the time delay for the **Air pressure, low** alarm This parameter is applicable to the pneumatic wiper.	1–30	3	**Minutes**
Bank A	Resets the wiping cycles counters of the applicable UV bank When the all wiper rings of the UV bank are replaced, the wiping cycles counters are reset.	**Clear**	-	-
Bank B				
Bank C				
Bank D				

6.7.6 The Penstock Settings screen

This screen is password-protected and is applicable to the outlet penstock. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Water Level Setpoint	Sets the water level limit for the UV channel	890–1200 35–47.25	1070 42.125	**mm** **Inches**

Parameter	Description	Selection	Default	Unit
Pulse Range	Sets the water level range outside the deadband limits This parameter is used to calculate the following setpoints: • **Water level very high** = **Water Level Setpoint** + (**Pulse Range**/2) • **Water level very low** = **Water Level Setpoint** – (**Pulse Range**/2)	76–155 3–6	76 3	**mm** **Inches**
Break Time	Sets the time delay between the penstock movements This parameter prevents unnecessary movements of the penstock.	3–30	3	**Seconds**
Pulse Time	Sets the maximum time period for the penstock to open or close	0.25–5.0	3	**Seconds**
Deadband	Sets the deadband value for the water level setpoint The penstock does not operate automatically when the water level is in the deadband limits This parameter is used to calculate the following setpoints: • **Water level high** = **Water Level Setpoint** + (**Deadband**/2) • **Water level low** = **Water Level Setpoint** – (**Deadband**/2)	12–50 0.5–2	19 0.75	**mm** **Inches**

6.7.7 The Lamp Hours Management screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
Bank	Allows the selection of the UV bank that needs lamp replacement	**Bank A** **Bank B** **Bank C** **Bank D**
Lamp	Allows the selection of the UV lamp that needs lamp hours update	-
Current Lamp Hours	Shows the total hours of the UV lamp operation	-
New Lamp Hours	Allows the entry of the new UV lamp hours A tap on the **Update** button confirms the entry.	-
Reset the Lamp Data	Resets the lamp hours of all the UV lamps in the UV bank The **Yes** option resets the hours.	**Yes** **No**

Parameter	Description	Selection
Reset Bank Cycles	Resets the operating cycles of all the UV lamps in the UV bank The **Yes** option resets the operation cycles.	**Yes** **No**

6.7.8 The General Settings screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
Signal Failure Alarm	Sets the time delay for the signal failure alarms for the following items: • Flow rate • UVT monitor • UV sensor • Ultrasonic sensors • Outlet penstock position	0–60	30	**Seconds**
Warning SP, UV Intens. Low	Sets the value for the warning for low UV intensity	-	-	**W/m²** **mW/cm²**
Alarm SP, UV Intens. Low	Sets the value for the alarm for low UV intensity	-	-	**W/m²** **mW/cm²**
UV Int. Low Delay	Sets the time delay for the warning for low UV intensity	0–30	5	**Minutes**
Max. Lamps to Fail	Sets the maximum number of UV lamps in a UV bank that are allowed to fail	1–10	• 4 for a UV bank with 12 or 16 UV lamps • 6 for a UV bank with 20 to 48 UV lamps	-
Lamp Failure Delay	Sets the time delay for the following alarms for the applicable UV bank: • **Bank A: Failure Lamp** • **Multi-Lamp Failure, Bank A**	1–15	10	**Minutes**
No alarms, the system starts	Sets the time delay that inhibits the alarms when the UV system starts	0–10	3	**Minutes**
No alarms, the bank starts	Sets the time delay that inhibits the alarms when the UV bank turns on	0–10	5	**Minutes**

6.7.9 The UVT Settings screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection	Default	Unit
UVT Meter ON/OFF	Allows the UV system to monitor UV transmittance from the UVT monitor This parameter is applicable to the UVT monitor.	**ON** **OFF**	-	-
Min. Design UVT	Sets the minimum value of the UV transmittance	0–100	See the order specification.	%

6.7.10 The Date/Time screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
Day:	Sets the day	1–31
Month:	Sets the month	1–12
Year:	Sets the year in the YYYY format	-
Hour:	Sets the hour in the 24-hour format	0–23
Minute:	Sets the minute	0–59

6.7.11 The Language Selection screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
Language Selection	Sets the preferred language	• English • German • French • Italian • Portuguese • Spanish • Swedish • Polish • Norwegian

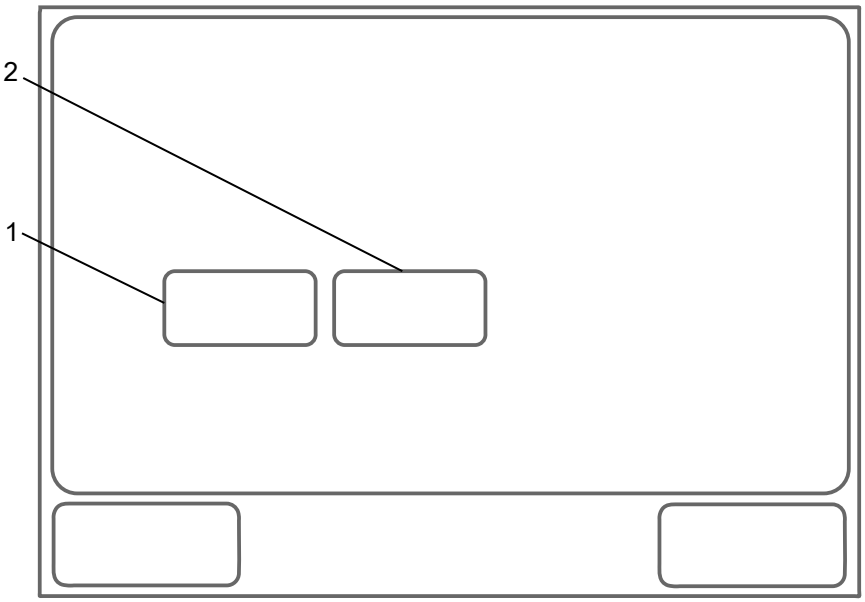
6.7.12 The Units of Measurement screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
UV Intensity	Sets the unit for UV intensity	**W/m²** **mW/cm²**
Flow	Sets the unit for flow rate	**m³/h** **gpm** **MGD** **L/s**
Water Level	Sets the unit for water level	**mm** **Inches**

6.7.13 The Network Setup Menu screen

This screen is password-protected. For more information, see *The Password screen* on page 57.



Position	Button	Description
1	**Module**	Opens the **Module Type** screen that allows selection of the network communication module
2	**Config**	Opens the **Network Configuration** screen that allows configuration of the network parameters

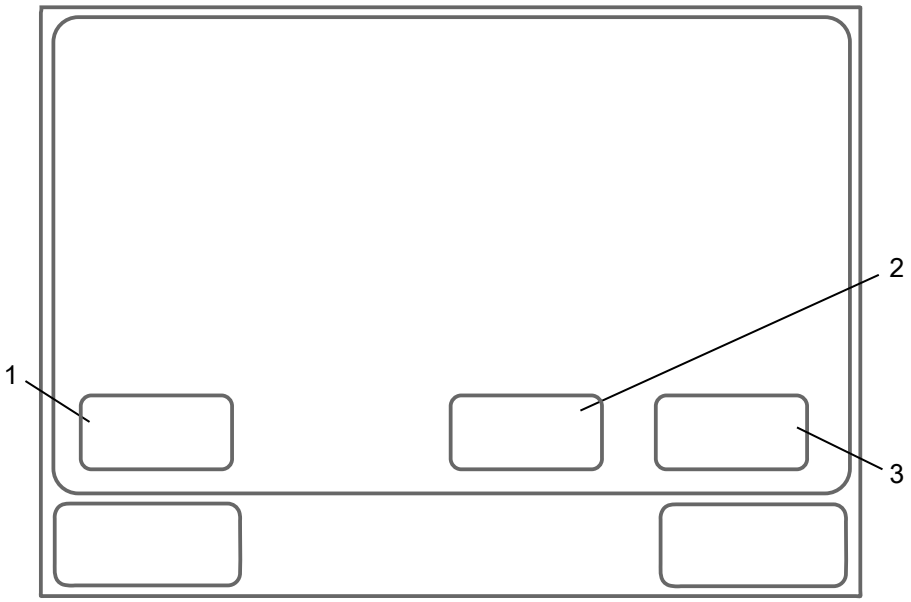
The Module Type screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description	Selection
Module Type	Sets the communication type After the selection is confirmed, a restart of the UV system is necessary.	• None • **EtherNet/IP** • **Profibus DP** • **Modbus TCP** • **ProfiNet**

The Network Configuration screen

This screen is password-protected. For more information, see *The Password screen* on page 57.



Position	Button	Description
1	**Write**	Transfers the inputs to the bus coupler
2	**N-Reset**	Resets the node address
3	**Read**	Shows the configured IP addresses

Parameter	Description
Profibus Address	Sets the PROFIBUS address of the PROFIBUS module

The following parameters are available when the EtherNet/IP or **Modbus TCP** network module is installed.

Parameter	Description	Selection	Default
IP Address	Sets the IP address of the communication type	-	-
Subnet Mask	Sets the subnet mask value	-	255.255.255.0
Def. Gateway	Sets the default gateway value	-	0.0.0.0
DHCP Enabled	Enables the DHCP protocol	**Yes** **No**	**No**

6.7.14 The module lift screen

This screen is password-protected. For more information, see *The Password screen* on page 57.

Parameter	Description
OK to Lift?	Shows the status of the applicable UV bank: • **Yes** = The **Lift** button is enabled. A tap on the **Lift** button sends an output signal that lights up the push-button on the lift control cabinet. • **No** = The **Lift** button is disabled.

6.8 Event messages

The **Events** list screen shows the following event messages. These messages are not considered alarms or warnings.

Message	Message location on EcoTouch	Description	Remark
System Power ON	Events list	The UV system is turned on.	–
System Power OFF		The UV system is turned off.	–
System Start	Events list and banner	This message appears under one of the following conditions: • The UV system is set to **Local**. • The contact closure of the UV system is energized For more information, see *The Remote Mode Selection screen* on page 63.	–
System Stop		This message appears under one of the following conditions: • The UV system is set to **Off**. • The contact closure of the UV system is de-energized. For more information, see *The Remote Mode Selection screen* on page 63.	When the UV system is turned off, the water in the UV channel is not disinfected correctly
Operator Reset	Events list	The warning, alarm, or event is reset from the reset push button on the EcoTouch controller.	–
Remote Reset		The warning, alarm, or event is reset remotely.	–
Bank A ON	Events list and banner	The applicable UV bank is turned on.	–
Bank A OFF		The applicable UV bank is turned off.	–
Bank A: wiping		The wiping operation of the applicable UV bank is in progress. This message is applicable to the pneumatic wiper.	
Wiper A Cycle, finished		The wiping operation for the applicable UV bank is completed. This message is applicable to the pneumatic wiper.	–
Bank A-1 Wiping		The wiping operation of the UV module for the applicable UV bank is in progress. This message is applicable to the electric wiper.	–
Wiper A-1 Finished		The wiping operation of the UV module for the applicable UV bank is completed. This message is applicable to the electric wiper.	–
Maintenance Mode ON	Events list	The maintenance mode is turned on.	• The UV banks are turned on or turned off manually. • The following alarms of the applicable UV bank are suppressed: – **UV Dose Low** – **Bank A: UV Intensity Low**
Maintenance Mode OFF		The maintenance mode is turned off.	• The UV system turns on. • If the dose control is on, the UV system operates according to the dose-pacing algorithm.

7 Commissioning, Startup, Operation, and Shutdown

7.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

WARNING: Crush Hazard

The automatic wiper or the penstock can operate automatically. Stay clear of the automatic wiper or the penstock when the UV system is in operation.

WARNING: Fall Hazard

Falls into the UV channel can cause serious injuries. Always keep the channel covers closed.

CAUTION: Ultraviolet (UV) Light Hazard

UV light can burn the eyes and the skin. Never operate the UV lamps outside the UV system. Use personal protective equipment.

CAUTION: Entanglement Hazard

Loose clothing can entangle in the shaft that rotates. Do not wear loose clothing.

CAUTION: Thermal Hazard

The surfaces or parts of the unit may become hot during operation. Allow surfaces to cool before starting work, or wear heat-protective clothing.

NOTICE:

UV lamps and quartz sleeves are fragile. These parts must be handled carefully.

NOTICE:

The operator must make sure that the water level in the UV channel stays constant. The UV module must not be submerged.

NOTICE:

The operator must not climb on the UV channel cover or put anything on it.

NOTICE:

The UV system must not be turned on and off more than four times in a 24-hour operating period.

Personal protective equipment

NOTICE:

One of the following personal protective equipment is needed:

- UV protective safety goggles
- UV protective face shield

Commissioning

The commissioning procedure is applicable to waste water treatment plants.

Prerequisites

Before the unit is commissioned, the following prerequisites must be followed:

- There must be water in the UV channel.
- The volume and quantity of the treated water follow the specifications in the technical data.
- The power supply for the UV system follows the specifications in the technical data.
- The upstream and downstream processes of the wastewater treatment plant must operate correctly.

7.2 Adjust the flowmeter

1. Record the reading of the flowmeter at maximum flow rate.
2. From the HMI, go to **Menu** > **Settings** > **Flow**.
3. Type the recorded value of the maximum flow rate for the 20 mA signal.
   For more information, see *The Flow Settings screen* on page 68.
4. Check that the flow rates on the flowmeter and the **Main** screen of the HMI are the same at different flow rates.
   For more information, see *The Main screen* on page 57.

7.3 Adjust the downward opening penstock

Adjust the downward opening penstock (DOP).

For more information, see the DOP manual in the binder.

7.4 Set up the UV system

1. Set the operation of the UV dose control:
   a) From the HMI, go to **Menu** > **Settings** > **Dose**.
   b) Select the **Dose Control** parameter.
      For more information, see *The Dose Control or RED Control screen* on page 66.
2. Set the status of the UV bank:
   a) From the HMI, go to **Menu** > **Settings** > **Banks**.
   b) Set the status for the UV bank.
      For more information, see *The Bank Control screen* on page 67.

7.5 Start the UV disinfection

The following conditions must be checked:

- The water level in the UV channel is correct.
- There are no high priority alarms.

1. From the HMI, go to **Menu > L/O/R**.
2. Start the UV system in one of the following modes:
   - **Local**
   - **Remote**

   For more information, see *The Remote Mode Selection screen* on page 63.

7.5.1 The startup process

1. The **Duty** and the **Assist** UV banks turn on at 100% power according to the following conditions:

Condition	Result
The dose-pacing is on.	– The UV lamps operate at 100% power until the time that is set in the parameter **Min. Full Power Time** expires. – The UV banks stay on for the time that is set in the **Bank, Min Time ON** parameter. – The received UV dose is more than or equal to the target UV dose.
The dose-pacing is off.	The UV banks operate at 100% power.

2. After the time delay that is set in the parameter **No alarms, the system starts** expires, these alarms and warnings are monitored:
   - **UV Dose Low** or **RED Low**
   - **Flow Rate Low**
   - **Flow Rate High**
3. After the time delay that is set in the parameter **No alarms, the bank starts** expires, these alarms and warnings are monitored:
   - **Bank A: UV Intensity Low**
   - **Bank A: Failure Lamp**
   - **Multi-Lamp Failure, Bank A**

7.6 Stop the UV disinfection

1. From the HMI, go to **Menu > L/O/R**.
2. Turn off the UV system.

Mode	Action
Local	Select the **Off** mode.
Remote	Select the **Off** mode. The operator must de-energize the contact closure remotely.

For more information, see *The Remote Mode Selection screen* on page 63.

7.6.1 The shutdown process

1. The UV lamps turn off.
2. The wipers continue to operate automatically under one of the following conditions:
   - The UV module is not lifted from the UV channel.
   - The water level in the UV channel is low.
3. If an outlet penstock is installed, the penstock continues to operate.

NOTICE:

When the UV system is shut down, the water in the UV channels is not disinfected correctly.

8 Maintenance

8.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.

DANGER: Electrical Hazard

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.

WARNING: Crush Hazard

The UV module can fall down or swing uncontrollably, and injure people or damage property. Never use a crane to lift the UV modules during strong winds.

WARNING: Crush Hazard

Always lift the unit by its designated lifting points.

Use suitable lifting equipment and ensure that the product is properly harnessed.

Wear personal protective equipment.

Stay clear of cables and suspended loads.

WARNING: Crush Hazard

If the UV module is not attached safely, it can fall down. Set the safety lock pins in the locked position before the maintenance of the UV module starts. Install the safety block before the maintenance below the UV module starts. Do not remove the safety lock pins and safety block during maintenance.

WARNING: Fall Hazard

Falls into the UV channel can cause serious injuries. Always keep the channel covers closed.

CAUTION: Entanglement Hazard

Loose clothing can entangle in the shaft that rotates. Do not wear loose clothing.

CAUTION: Sewage Hazard

Risk of infection during maintenance of theUV channel components. Follow all the regulations, codes, and health and safety directives.

CAUTION: Ultraviolet (UV) Light Hazard

UV light can burn the eyes and the skin. Never operate the UV lamps while UV module is lifted for service.

CAUTION: Electrical Hazard

Prevent cables from becoming sharply bent or damaged.

CAUTION: Ultraviolet (UV) Light Hazard

UV light can burn the eyes and the skin. Never operate the UV lamps outside the UV system. Use personal protective equipment.

CAUTION: Thermal Hazard

The surfaces or parts of the unit may become hot during operation. Allow surfaces to cool before starting work, or wear heat-protective clothing.

NOTICE:

UV lamps and quartz sleeves are fragile. These parts must be handled carefully.

NOTICE:

The operator must not climb on the UV module or put anything on it.

NOTICE:

The operator must not climb on the UV channel cover or put anything on it.

NOTICE:

The operator must make sure that the cables are not damaged.

Personal protective equipment

NOTICE:

The following personal protective equipment is needed:

- Protective gloves
- Safety footwear
- Safety helmet
- Safety goggles or face shield for UV protection

8.2 Inspection

UV channel

Part	Action	Interval
UV channel	Clean the UV channel.	Depends on the operational condition
Weir	1. Check the weir for blockage. 2. If necessary, clear the blockage.	Daily
	1. Check for leakage around the sealed joints. 2. If necessary, repair the sealed joints. For more information, contact the local sales and service representative.	
Downward opening penstock (DOP)	1. Check the gate movement and the DOP for blockage. 2. If necessary, clear the blockage.	Daily
	Do the maintenance checks. For more information, see to the operation manual of the DOP.	Depends on the operational condition
Ultrasonic level sensor	1. Check for that there are no unwanted materials in the effluent water. 2. If necessary, remove the unwanted materials.	Daily
	Do the maintenance checks. For more information, see the operation manual of the ultrasonic level sensor.	Depends on the operational condition
Low-level probe	1. Check the probe rods of the low-level probe for blockage or algal bloom. 2. If necessary, clear the blockage or the algal bloom.	Daily
UV transmittance (UVT) monitor	Do the maintenance checks. For more information, see the operation manual of the UVT monitor.	Depends on the operational condition

UV lamp modules

Part	Action	Interval
Wiper	1. Check the cleaning function of the wiper rings. 2. If necessary, replace the wiper rings. For more information, see *Replace the wiper rings* on page 93.	Weekly
	Replace the wiper rings. For more information, see *Replace the wiper rings* on page 93.	30 000 cycles
Wiper blade	1. Check the cleaning function of the wiper blade. 2. If necessary, replace the wiper blade. For more information, see *Replace the wiper rings* on page 93.	Weekly
	Replace the wiper blade. For more information, see *Replace the wiper rings* on page 93.	15 000 cycles
Spindle nut	Replace the spindle nut of the electric wiper. For more information, see *Replace the spindle nut* on page 95.	30 000 cycles

Part	Action	Interval
Quartz sleeves	1. Check the quartz sleeves for contamination. 2. If necessary, clean the quartz sleeves. For more information, see *Clean the transparent surfaces* on page 83.	Monthly
UV lamps	Replace the UV lamps. For more information, see *Replace the UV lamps* on page 91.	14 000 hours

Module guide rack

Part	Action	Interval
Electric lift, optional	1. Check the operation of the electric lift. For more information, see *Electric lift operation* on page 84. 2. If necessary, repair the electric lift. For more information, contact the local sales and service representative.	Depends on the operational condition

Air compressor

Part	Action	Interval
Air receiver	Drain the moisture from the manual drain valve.	Weekly
Cylinder	1. Check for air leaks. 2. If necessary, repair the leaks. For more information, contact the local sales and service reprenstative.	Weekly
	1. Check the operation of the cylinder. 2. If necessary, replace the cylinder. For more information, contact the local sales and service reprenstative.	
Filter	1. Check the operation of the automatic drain valve. 2. If necessary, replace the automatic drain valve. For more information, see the air compressor manual.	Weekly

Control cabinet

Part	Action	Interval
HMI	1. a. Check the status of the alarms in the HMI. b. If necessary, check the related system. c. Reset the alarm. For more information, see *Troubleshooting* on page 107.	Daily
	1. Check the operation hours and the operation cycles of the UV lamps. 2. If necessary, replace the UV lamps. For more information, see *Replace the UV lamps* on page 91.	Monthly

Part	Action	Interval
Fans	1. Check the operation of the fans. 2. If necessary, replace the fans. For more information, contact the local sales and service representative.	Daily
	Replace the fans. For more information, contact the local sales and service representative.	30 000 hours
Filter mats	Clean the filter mats. For more information, see *Clean the filter mat* on page 102.	Monthly
Air conditioner filters, optional	Clean the filter mats of the air conditioner.	Monthly
Fans of the electronic ballasts • Ballast racks in the electronic ballast cabinets	Replace the fans. For more information, contact the local sales and service representative.	40 000 hours

UV system

Part	Action	Interval
All parts	1. Check the UV system for damage and corrosion. 2. If necessary, repair the damaged parts. 3. If necessary, remove the corrosion. For more information, contact the local sales and service representative.	Monthly

8.3 Clean the transparent surfaces

The following parts have transparent surfaces:

- Quartz sleeve
- UV sensor window

Clean, cut-resistant gloves must be used to handle these parts.

Dirt or fingerprints on the transparent surfaces decrease the UV transmittance and the efficiency of the UV system.

Dirt and fingerprints that are not removed can burn into the glass during operation.

Use the following items to clean dirt and fingerprints from the transparent surfaces:

– Clean and soft cloth
– Pure alcohol

Record the task in the operation logbook.

8.4 Isolate the UV system

1. Close and lock out the inlet and the outlet isolation valves.
2. Turn off the UV system.
   The UV lamps turn off after 10 minutes.
   For more information, see *Stop the UV disinfection* on page 78.
3. Turn off and lock out the main isolator of the UV system.
4. Isolate and lock out the main power supply.
5. Drain the water from the UV channels.

Record the task in the operation logbook.

8.5 Operation of the UV module lift

NOTICE:

The operator must make sure that the flow is less than 108 m³/h for each UV lamp.

Only one UV module is lifted or lowered at a time.

8.5.1 Electric lift operation

It is not possible to lift the UV module under the following conditions:

- The UV module wiper is in operation.
- The UV bank is turned on.
- The electric lift drive has failed.

Lift the UV module

1. Remove the following items:
   1. Floor covers of the UV bank
   2. UV module covers
2. Disconnect the following items:
   - UV module connector
   - UV lamp connectors
   - Ground cable
3. On the HMI, go to **Menu** > **Settings** > **M-Lift**.
4. Tap the **Lift** button of the applicable UV bank.

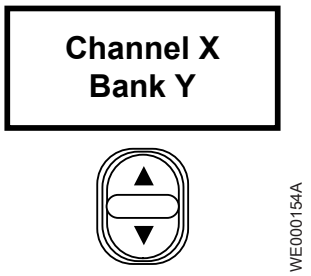
   For more information, see *The module lift screen* on page 74.

   The push button of the lift control cabinet of the selected UV bank lights up under the following conditions:

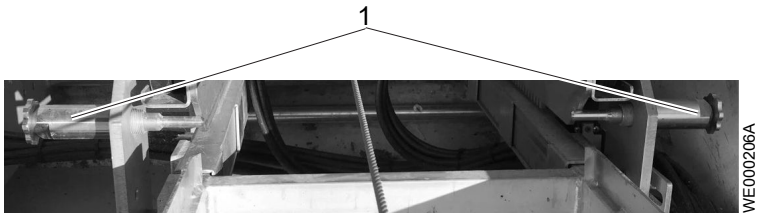
Conditions	Result
– The UV system is on. – The maintenance mode is off. – The selected UV bank is off.	The push-button lights up.
– The UV system is on. – The maintenance mode is off. – The selected UV bank is on.	1. All the UV banks turn on at 100% power. 2. The selected UV bank turns off after 10 minutes. 3. The push-button lights up.
– The UV system is on. – The maintenance mode is on.	1. The selected UV bank is turned off. 2. The push-button lights up.

5. Push down the up arrow of the push button until the UV module lifts completely.

   The electric lift stops automatically when the UV module is at the highest position.



6. Set the safety lock pins to the locked position.



1. Safety lock pins

7. If maintenance is necessary below the UV module, install the safety block on each UV module.
   a) Insert the safety block into the guide rail of the UV module.
      The safety block must be pushed down to the end position.

1. Safety block
2. Safety lock pin
3. Guide rail

   b) Use a wrench to tighten the bolts of the safety block.
      The bolts must be tightened fully.

After maintenance, the UV module must be lowered.

Lower the UV module

1. If installed, remove the safety block from each UV module.
2. Remove the safety lock pins from the locked position.
3. Push down the down arrow of the push-button of the applicable UV bank until the UV module lowers completely.
   The electric lift stops automatically when the UV module is at the lowest position.
4. Connect the following items:
   - UV module connector
   - UV lamp connectors
   - Ground cable
5. Reset the safety relay alarm of the UV bank.
   For more information, see *Safety Relay A* on page 122.
6. Install the following items:
   1. UV module covers
   2. Floor covers of the UV bank
7. On the HMI, go to **Menu** > **Settings** > **M-Lift**.
8. Tap the **Lift** button of the applicable UV bank to cancel the applicable UV bank.
   For more information, see *The module lift screen* on page 74.
   The push-button light of the lift control cabinet goes off.
   The selected UV bank turns on or turns off under the following conditions:

Conditions	Result
– The UV system is on. – The maintenance mode is on.	1. If the selected UV bank has **Duty** or **Assist** status, the UV bank turns on. 2. The **Standby** UV bank turns off after 10 minutes,
– The UV system is turned on. – The maintenance mode is off.	The selected UV bank stays turned off.

8.5.2 Manual lift operation

The UV module must not be lifted under the following conditions:

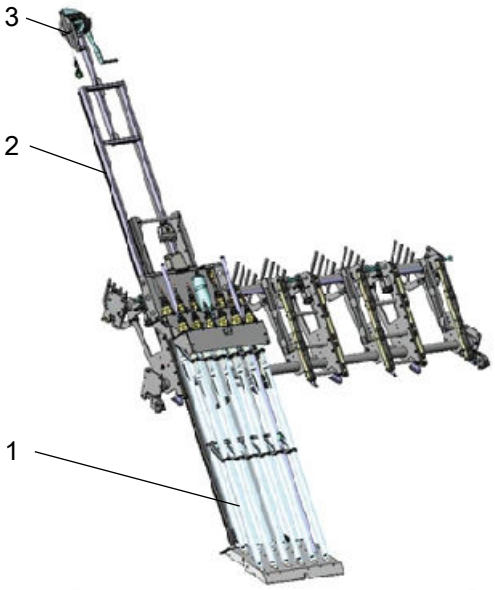
- The UV module wiper is in operation.
- The UV bank is turned on.

Lift the UV module

1. Remove the following items:
   1. Floor covers of the UV bank
   2. UV module covers
2. Disconnect the following items:
   – UV module connector
   – UV lamp connectors
   – Ground cable
3. On the HMI, go to **Menu** > **Settings** > **M-Lift**.
4. Tap the **Lift** button of the applicable UV bank.
   For more information, see *The module lift screen* on page 74.
   The selected UV bank turns off under the following conditions:

Condition	Result
– The UV system is on. – The maintenance mode is off. – The selected UV bank is off.	The selected UV bank stays turned off.
– The UV system is on. – The maintenance mode is off. – The selected UV bank is on.	1. All the UV banks turn on at 100% power. 2. The selected UV bank turns off after 10 minutes.
– The UV system is on. – The maintenance mode is on.	The selected UV bank is turned off.

5. Attach the mobile lifting structure to the UV module.

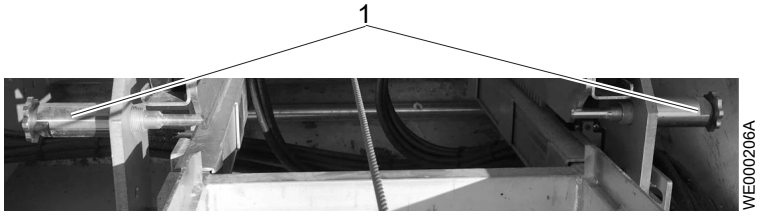


1. UV module
2. Mobile lifting structure
3. Manual winch

6. Use the manual winch to lift the UV module.

   The UV module must be lifted to the highest position.

7. Set the safety lock pins to the locked position.



1. Safety lock pins

8. If maintenance is necessary below the UV module, install the safety block on each UV module.

   a) Insert the safety block into the guide rail of the UV module.

      The safety block must be pushed down to the end position.

1. Safety block
2. Safety lock pin
3. Guide rail

   b) Use a wrench to tighten the bolts of the safety block.

      The bolts must be tightened fully.

After maintenance, the UV module must be lowered.

Lower the UV module

1. If installed, remove the safety block from each UV module.
2. Remove the safety lock pins from the locked position.
3. Use the manual winch to lower the UV module.
   The UV module must be lowered to the lowest position.
4. Remove the mobile lifting structure.
5. Connect the following items:
   - UV module connector
   - UV lamp connectors
   - Ground cable
6. Reset the safety relay alarm of the UV bank.
   For more information, see *Safety Relay A* on page 122.
7. Install the following items:
   1. UV module covers
   2. Floor covers of the UV bank
8. On the HMI, go to **Menu** > **Settings** > **M-Lift**.
9. Tap the **Lift** button of the applicable UV bank to cancel the applicable UV bank.
   For more information, see *The module lift screen* on page 74.
   The selected UV bank turns on or turns off according to the following conditions:

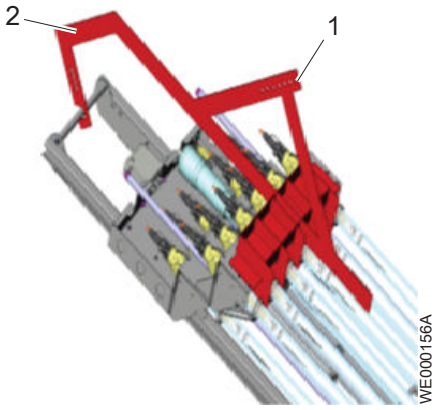
Condition	Result
– The UV system is on. – The maintenance mode is off.	1. If the selected UV bank is in **Duty** or **Assist** status, the UV bank turns on. 2. The **Standby** UV bank turns off after 10 minutes.
– The UV system is on. – The maintenance mode is on.	The selected UV bank stays off.

8.6 UV module removal

The crane that is used to lift the UV module must support the weight of the UV module. For more information, see *UV module* on page 16.

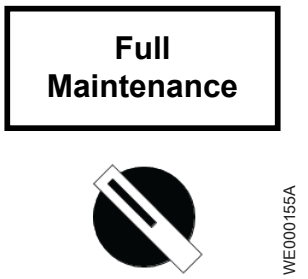
8.6.1 Remove the UV module: Electric lift

1. Lift the UV module.
   For more information, see *Lift the UV module* on page 84.
2. Attach the following items:
   1. Module lift device to the UV module
   2. Crane hook to the hook attachment point of the module lift device

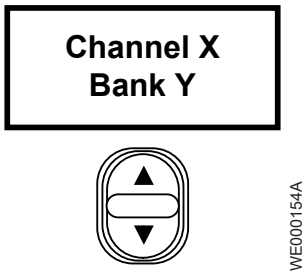


a. Hook attachment point
b. Module lift device

3. Use the crane hoist to support the UV module.
4. Remove the safety lock pins from the locked position.
5. Set the **Full Maintenance** switch of the lift control cabinet to the on position.



6. Push down the up arrow button of the lift control cabinet.

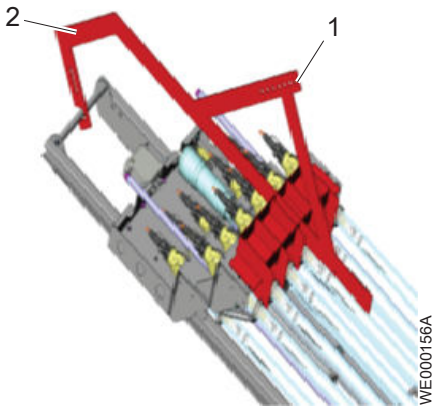


   The gear racks of the UV module must detach from the pinions of the module guide rack.
7. Carefully transport the UV module to the designated area.
8. Set the **Full Maintenance** switch to the off position.
9. Remove the following items:
   1. Crane hook from the Module lift device
   2. Module lift device

Record the task in the operation logbook.

8.6.2 Remove the UV module: Manual lift

1. Lift the UV module.
   For more information, see *Lift the UV module* on page 86.
2. Attach the following items:
   1. Module lift device to the UV module
   2. Crane hook to the hook attachment point of the module lift device



a. Hook attachment point
b. Module lift device

3. Use the crane hoist to support the UV module.
4. Remove the safety lock pins from the locked position.

5. Use the manual winch to detach the UV module from the pinions of the module guide rack.
6. Remove the mobile lifting structure.
7. Carefully transport the UV module to the designated area.
8. Remove the following items:
   1. Crane hook from the Module lift device
   2. Module lift device

Record the task in the operation logbook.

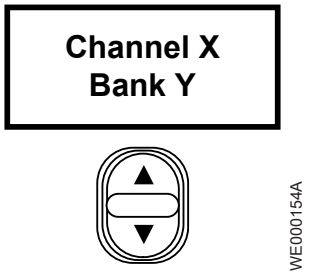
8.7 UV module installation

The crane that is used to lift the UV module must support the weight of the UV module. For more information, see *UV module* on page 16.

8.7.1 Install the UV module: Electric lift

1. Attach the following items:
   1. Module lift device to the UV module
   2. Crane hook to the hook attachment point of the module lift device
2. Carefully transport the UV module to the UV channel.
3. Align the gear racks of the UV module on the pinions of the module guide rack.
4. Push down the down arrow button of the lift control cabinet.

   The UV module must be lowered to a depth of 20 cm (7.9 in) approximately.



5. Remove the following items:
   1. Crane hook from the module lift device
   2. Module lift device
6. Lower the UV module

   For more information, see *Lower the UV module* on page 85.

Record the task in the operation logbook.

8.7.2 Install the UV module: Manual lift

1. Attach the following items:
   1. Module lift device to the UV module
   2. Crane hook to the hook attachment point of the module lift device
2. Carefully transport the UV module to the UV channel.
3. Align the gear racks of the UV module on the pinions of the module guide rack.
4. Attach the mobile lifting structure to the UV module.
5. Use the manual winch to attach the UV module to the pinions of the module guide rack.
6. Remove the following items:
   1. Crane hook from the module lift device
   2. Module lift device
7. Lower the UV module

   For more information, see *Lower the UV module* on page 88.

Record the task in the operation logbook.

8.8 Clean the UV module manually

Necessary items:

- Non-metallic brush
- Clean-soft cloth
- Steam cleaner or clean water supply from an external hose to remove biofouling
- Commercial acid cleaner to remove scale formation

This procedure is applicable when the automatic wiping operation does not remove the fouling on the quartz sleeves completely.

1. Turn off the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the **Maintenance Mode** parameter to **ON**.
   c) Set the applicable UV bank to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.
      The UV lamps must be allowed to cool down for 10 minutes.
2. Lift the UV module.

Lift type	Action
Electric	For more information, see *Lift the UV module* on page 84.
Manual	For more information, see *Lift the UV module* on page 86.

3. Clean the following locations of the UV module:

Location	Cleaning items
Surface of the UV module	– Non-metallic brush – Steam cleaner, clean water, or commercial acid cleaner The dirt must not be washed into the UV channel.
UV sensor window	– Clean-soft cloth – Steam cleaner, clean water, or commercial acid cleaner
Quartz sleeves	

   The cables and connectors of the UV module must be dried.
4. Lower the UV module.

Lift type	Action
Electric	For more information, see *Lower the UV module* on page 85.
Manual	For more information, see *Lower the UV module* on page 88.

5. Turn on the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the applicable UV bank to **ON**.
   c) Set the **Maintenance Mode** parameter to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.
6. Push the alarm reset button to clear the alarms.
   The UV system must operate correctly.

Record the task in the operation logbook.

8.9 Replace the UV lamps

Before a defective UV lamp is replaced, check the following conditions:

Condition	Action
The UV intensity is low.	1. If the quartz sleeves are dirty, clean the quartz sleeves. For more information, see *Clean the UV module manually* on page 91. 2. If the UV intensity is low after the quartz sleeves are cleaned, replace the defective UV lamps with spare UV lamps.
All the UV lamps must be replaced according to the maintenance interval.	Replace all the UV lamps with new UV lamps. The replaced UV lamps that have remaining lamp hours can be used as spare UV lamps.
The defective UV lamp is near the UV sensor.	Replace the defective UV lamp with a UV lamp from the same UV bank that has average lamp life. For more information, see the BANK OVERVIEW screen on the HMI in the control philosophy in the binder. A new UV lamp must not be used because a new UV lamp generates higher UV intensity. A spare UV lamp must then be installed at the position from where the UV with an average lamp life is removed.

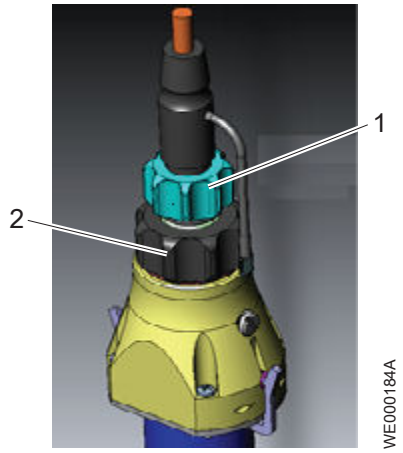
8.9.1 Remove the UV lamp

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Turn off the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the **Maintenance Mode** parameter to **ON**.
   c) Set the applicable UV bank to **OFF**.
   For more information, see *The Maintenance Mode screen* on page 68.
   The UV lamps must be allowed to cool down for 10 minutes.
2. Remove the following items:
   1. Floor covers of the UV bank
   2. UV module covers
3. Disconnect the UV lamp connector.
4. Manually loosen the UV lamp holder.



1. UV lamp connector
2. UV lamp holder

5. Carefully remove the UV lamp from the quartz sleeve.
6. If all the UV lamps of the UV bank must be removed, repeat step *3* on page 92 through step *5* on page 92 for each UV lamp.

Record the task in the operation logbook.

8.9.2 Install the UV lamp

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Check the condition of the quartz sleeve of the UV lamp that is removed.

Condition	Action
Fouling	Clean the quartz sleeve. For more information, see *Clean the transparent surfaces* on page 83.
Cracks	Replace the quartz sleeve.

2. Carefully insert the UV lamp into the quartz sleeve.
3. Manually tighten the UV lamp holder.
4. Connect the UV lamp connector.
5. If all the UV lamps of the UV bank must be replaced, repeat step *1* on page 93 through step *4* on page 93 for each UV lamp.
6. Update the UV lamp parameters.

Condition	Action
All the UV lamps of the UV bank are replaced.	1. On the HMI, go to **Menu** > **Settings** > **Lamps**. 2. Reset the following parameters: – **Reset the Lamp Data** – **Reset Bank Cycles**
One UV lamp is replaced.	1. On the HMI, go to **Menu** > **Settings** > **Lamps**. 2. Enter the new UV lamp hours in the **New Lamp Hours** parameter.

   For more information, see *The Lamp Hours Management screen* on page 70.
7. Install the following items:
   1. UV module covers
   2. Floor covers of the UV bank
8. Turn on the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the applicable UV bank to **ON**.
   c) Set the **Maintenance Mode** parameter to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.
9. Reset the safety relay alarm of the UV bank.
   For more information, see *Safety Relay A* on page 122.

Record the task in the operation logbook.

8.10 Replace the wiper rings

8.10.1 Remove the wiper rings

NOTICE:

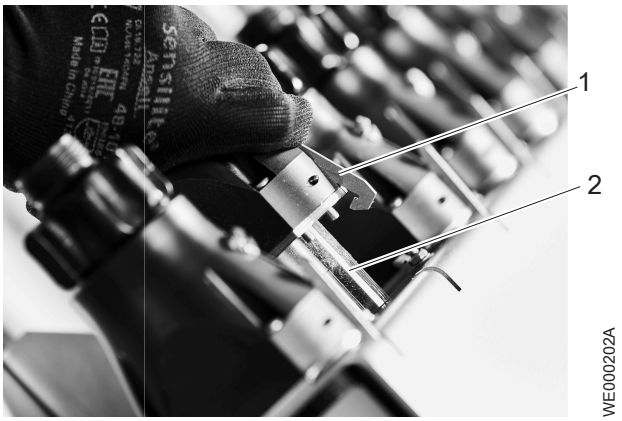
Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Turn off the UV bank.

a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
b) Set the **Maintenance Mode** parameter to **ON**.
c) Set the applicable UV bank to **OFF**.
For more information, see *The Maintenance Mode screen* on page 68.
The UV lamps must be allowed to cool down for 10 minutes.

2. Remove the following items:
   1. Floor covers of the UV bank
   2. UV module covers
3. Remove the UV lamp modules.
   a) Disconnect the UV lamp connectors.
   b) Use the quick connector to release each UV lamp module from the UV module.



1. Quick connector
2. UV lamp module

   c) Carefully slide each UV lamp module from the UV module.
4. Lift the UV module.

Lift type	Action
Electric	Do steps *3* on page 84 through *6* on page 84.
Manual	Do steps *3* on page 86 through *7* on page 87.

5. Remove the wiper rings and the wiper blade from the wiper arm.
   There is one wiper blade in each UV bank.

1. Wiper rings
2. Wiper blade
3. UV sensor

Record the task in the operation logbook.

8.10.2 Install the wiper rings

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Clean the quartz sleeves.
   For more information, see *Clean the transparent surfaces* on page 83.
2. Install the new wiper rings and the wiper blade on the wiper arm.
3. Lower the UV module.

Lift type	Action
Electric	Do steps *2* on page 85 through *3* on page 85.
Manual	Do steps *2* on page 88 through *4* on page 88.

4. Install the UV lamp modules.
   a) Carefully slide each UV lamp module into the UV module.
   b) Use the quick connector to connect each UV lamp module to the UV module.
5. Connect the following items:
   – UV module connector
   – UV lamp connectors
   – Ground cable
6. Reset the safety relay alarm of the UV bank.
   For more information, see *Safety Relay A* on page 122.
7. Install the following items:
   1. UV module covers
   2. Floor covers of the UV bank
8. Reset the wiping cycles counter.
   a) On the HMI, go to **Menu** > **Settings** > **Wiper**.
   b) Select **Clear** to reset wiping cycles counter of the UV bank.
      For more information, see *The Pneumatic or Electric Wiper Settings screen* on page 69.
9. Turn on the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the applicable UV bank to **ON**.
   c) Set the **Maintenance Mode** parameter to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.

Record the task in the operation logbook.

8.11 Replace the spindle nut

8.11.1 Remove the spindle nut

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Turn off the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the **Maintenance Mode** parameter to **ON**.
   c) Set the applicable UV bank to **OFF**.

For more information, see *The Maintenance Mode screen* on page 68.

The UV lamps must be allowed to cool down for 10 minutes.

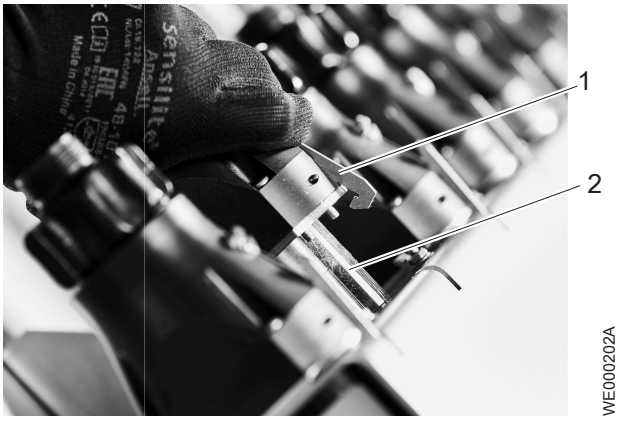
2. Remove the UV module.

   For more information. see *Remove the UV module: Electric lift* on page 88.

3. Carefully transport the UV module to the designated area.
4. Remove the UV lamp modules.

   All the UV lamp modules that are around the wiper motor must be removed.

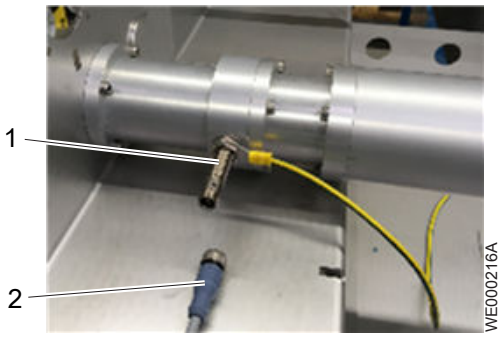
   a) Use the quick connector to release each UV lamp module from the UV module.



1. Quick connector
2. UV lamp module

   b) Carefully slide each UV lamp module out of the UV module.

5. Disconnect the proximity sensor connector of the wiper motor.

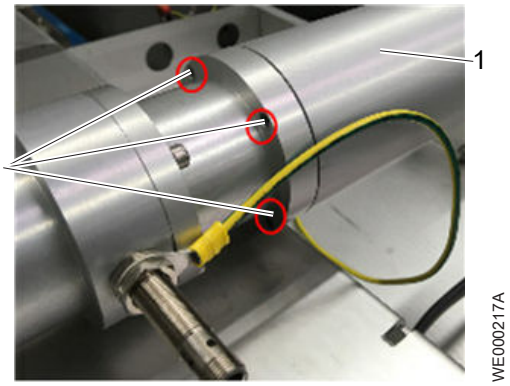


1. Proximity sensor
2. Connector

6. Remove the wiper motor housing.

   a) Remove the screws of the wiper motor housing.

   A hexagon wrench must be used to loosen the screws.

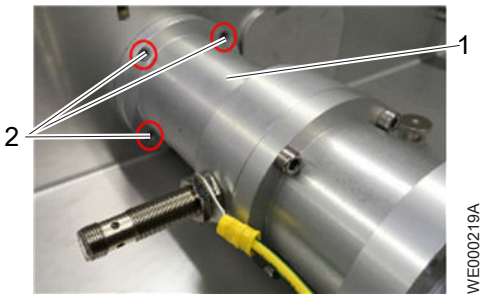


1. Wiper motor housing
2. Screws

   b) Remove the wiper motor housing.

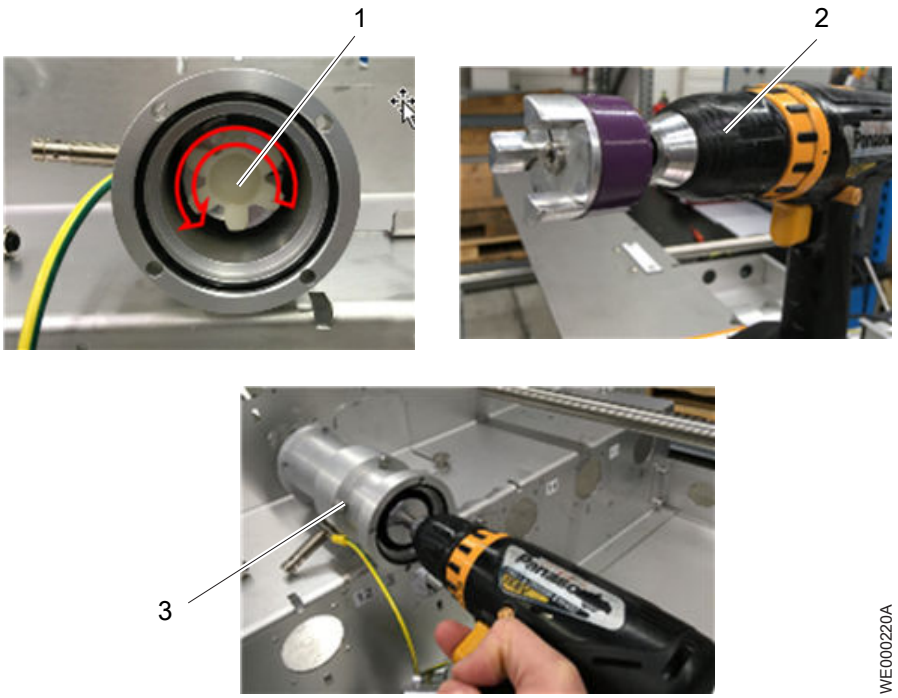
7. Remove the screws of the coupler.

   A hexagon wrench must be used to loosen the screws.



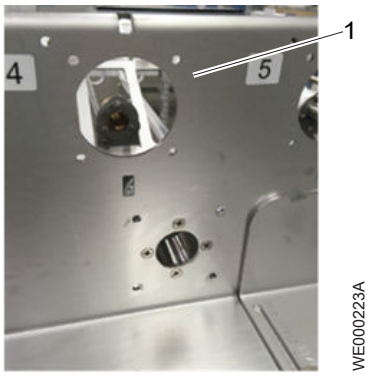
1. Coupler
2. Screws

8. Remove the spindle nut.
   a) Use one of the following methods to rotate the spindle in the counterclockwise direction:
      – Manually
      – Cordless screwdriver with an adapter



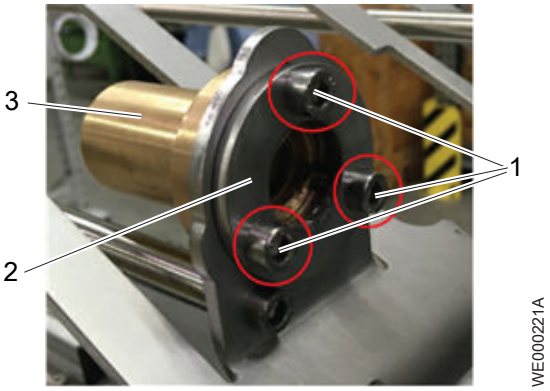
1. Spindle
2. Cordless screwdriver with an adapter
3. Coupler

   b) Rotate the spindle until the spindle detaches from the spindle nut.
   c) Remove the spindle from the UV module.



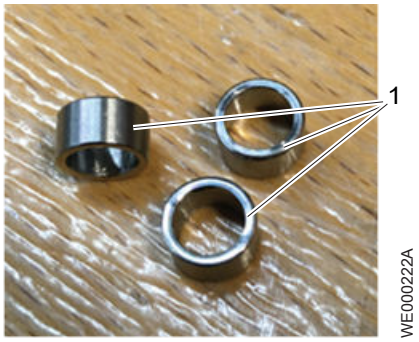
1. UV module

d) Remove the screws that hold the spindle nut.



1. Screws
2. Flange
3. Spindle nut

e) Carefully remove the spacers that are between the screws and the flange.



1. Spacers

f) Remove the spindle nut.

Record the task in the operation logbook.

8.11.2 Install the spindle nut

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Install the spindle nut.
   a) Carefully install the spacers between the screws and the flange.
   b) Install the screws that hold the spindle nut.
2. Install the spindle.
   a) Put back the spindle.
   b) Use one of the following methods to rotate the spindle in the clockwise direction:

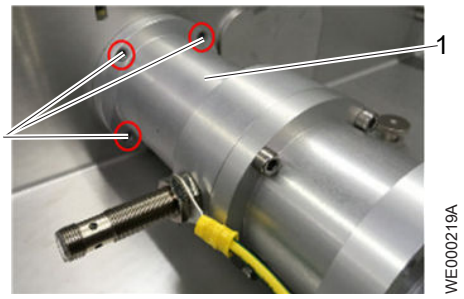
- Manually
- Cordless screwdriver with an adapter

c) Rotate the spindle.

The threads of the spindle must connect to the spindle nut.

3. Install the coupler.
   a) Put back the coupler.
   b) Install the screws.

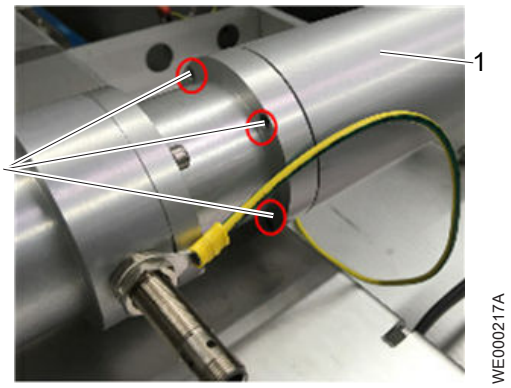
   A hexagon wrench must be used to tighten the screws.



1. Coupler
2. Screws

4. Install the wiper motor housing.
   a) Put back the wiper motor housing.
   b) Install the screws.

   A hexagon wrench must be used to tighten the screws.



1. Wiper motor housing
2. Screws

5. Connect the proximity sensor connector.
6. Install the UV lamp modules.
   a) Carefully slide each UV lamp module into the UV module.
   b) Use the quick connector to connect each UV lamp module to the UV module.
7. Restore the UV module.

   For more information. see *Install the UV module: Electric lift* on page 90.
8. Turn on the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the applicable UV bank to **ON**.
   c) Set the **Maintenance Mode** parameter to **OFF**.

      For more information, see *The Maintenance Mode screen* on page 68.

Record the task in the operation logbook.

8.12 Replace the UV sensor

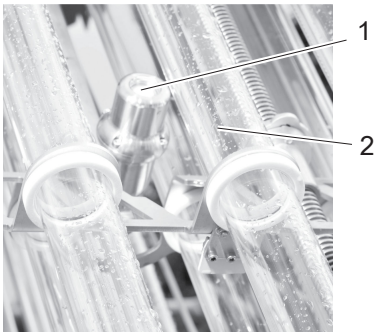
8.12.1 Remove the UV sensor

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

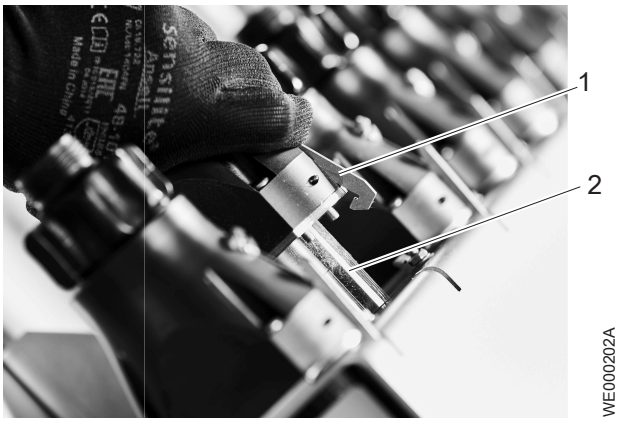
The UV lamp module must be held by the ceramic end pieces.

1. Turn off the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the **Maintenance Mode** parameter to **ON**.
   c) Set the applicable UV bank to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.
      The UV lamps must be allowed to cool down for 10 minutes.
2. Remove the following items:
   1. Floor covers of the UV bank
   2. UV module covers
3. Remove the UV lamp module.
   a) Disconnect the connector of the UV lamp module that is opposite to the UV sensor.



1. UV lamp module
2. UV sensor

   b) Use the quick connector to release the UV lamp module from the UV module.



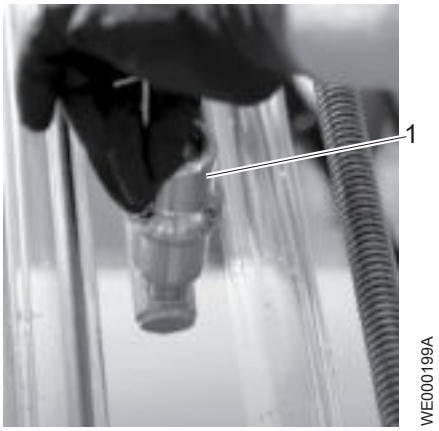
1. Quick connector
2. UV lamp module

   c) Carefully slide the UV lamp module from the UV module.
4. Lift the UV module.

Lift type	Action
Electric	Do steps *3* on page 84 through *6* on page 84.

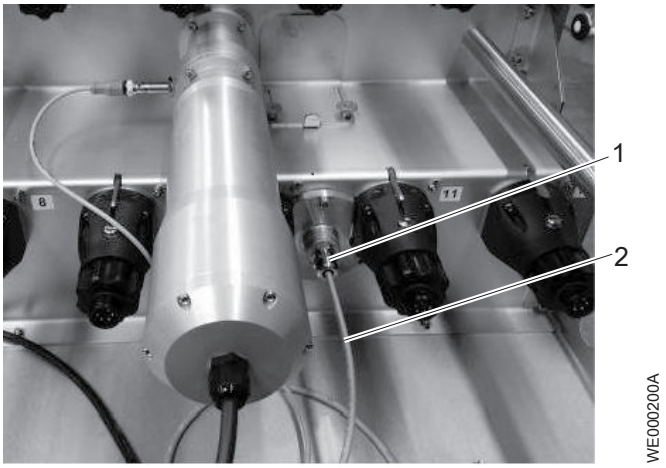
Lift type	Action
Manual	Do steps *3* on page 86 through *7* on page 87.

5. Remove the UV sensor.
   a) Remove the UV sensor cover.
      A hexagon wrench must be used to remove the screws of the UV sensor cover.



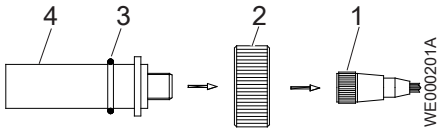
1. UV sensor cover

   b) Loosen the nut of the UV sensor cable that is at the top of the UV module.
      A wrench must be used to loosen the nut.



1. Nut
2. UV sensor cable

   c) Release the tension of the UV sensor cable.
   d) Disconnect the connector from the UV sensor.
   e) Loosen the knurled nut by using hand.
   f) Remove the UV sensor.



1. Connector
2. Knurled nut
3. O-ring
4. UV sensor

Record the task in the operation logbook.

8.12.2 Install the UV sensor

NOTICE:

Protective gloves must be used to handle the UV lamp and the UV lamp module.

The UV lamp module must be held by the ceramic end pieces.

1. Install the UV sensor.
   a) If the O-ring is damaged, replace the O-ring.
   b) Connect the UV sensor connector.
   c) Manually tighten the knurled nut.
   d) Use a wrench to tighten the nut of the UV sensor cable.
   e) Install the UV sensor cover.
      A hexagon wrench must be used to tighten the screws of the UV sensor cover.
2. Lower the UV module.

Lift type	Action
Electric	Do steps *2* on page 85 through *8* on page 85.
Manual	Do steps *2* on page 88 through *9* on page 88.

3. Install the UV lamp module.
   a) Carefully slide the UV lamp module into the UV module.
   b) Use the quick connector to connect the UV lamp module to the UV module.
   c) Connect the UV lamp connector.
4. Turn on the UV bank.
   a) On the HMI, go to **Menu** > **Settings** > **Maint.**.
   b) Set the applicable UV bank to **ON**.
   c) Set the **Maintenance Mode** parameter to **OFF**.
      For more information, see *The Maintenance Mode screen* on page 68.

Record the task in the operation logbook.

8.13 Clean the filter mat

Turn off the main isolator of the control cabinet.

The filter mat must be clean so that the airflow increases and the internal temperature of the control cabinet decreases.

1. Remove the fan guard from the air inlet.
2. Remove the filter mat from the air inlet.
3. Use one of the following items to clean the filter mat:
   – Blower
   – Laundry detergent at 60°C (140°F)
      The filter mat must be dried.
4. Put the filter mat on the air inlet.
5. Install the fan guard on the air inlet.

Turn on the mains isolator of the control cabinet.

Record the task in the operation logbook.

9 Water Sampling

9.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

WARNING: Fall Hazard

Falls into the UV channel can cause serious injuries. Always keep the channel covers closed.

CAUTION: Sewage Hazard

Risk of infection during maintenance of theUV channel components. Follow all the regulations, codes, and health and safety directives.

CAUTION: Cut Hazard

Steel sheets can have sharp edges. Wear protective gloves.

CAUTION: Entanglement Hazard

Loose clothing can entangle in the shaft that rotates. Do not wear loose clothing.

NOTICE:

The operator must not climb on the UV module or put anything on it.

Personal protective equipment

NOTICE:

The following personal protective equipment is needed:

- Protective gloves
- Safety footwear
- Safety goggles or face shield for UV protection

9.2 Standard

The sampling must be done according to ISO 19458:2006, Part 1: Guidance on the design of sampling programs and sampling techniques, or the equivalent.

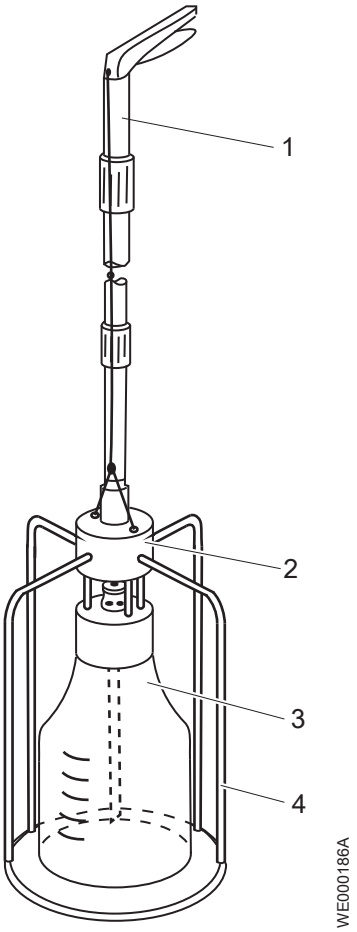
9.3 Examples of equipment

Sterile bottle

A sterile bottle is used to collect samples manually from small UV channels. The volume of the bottle must meet the requirements of the laboratory.

Depth sampler

A depth sampler is used to collect samples from large UV channels.



Position	Part	Description
1	Telescopic rod	The rod must be minimum 1 m (3.3 ft).
2	Valve	The valve has a wire that is connected to the handle of the telescopic rod.
3	Bottle	A sterile bottle must be used. The volume of the bottle must meet the requirements of the laboratory.
4	Cage	The cage protects the bottle.

9.4 Sampling plan

Requirements

- The total number of sampling bottles must be prepared according to the number of samples that are necessary.
- The sampling plan must be changed according to the number of parameters that are recorded. During sampling, the following parameters must be recorded for each sample:
  - Transmittance
  - UV dose
  - Flow rate
  - Suspended solids
  - Temperature
  - Values from the sensors
  - Power

Example

Bottle number			1	2	3
Date		DD-MM-YYYY	19.06.2005		
Time		hh:mm	08:00		
Flow rate		m^3/h	1000		
UV transmission, T1 cm		%	67		
UV dose		J/m^2	450		
Suspended solids		mg/L	5		
Total coliforms	Before the UV treatment	1/100 ml	80 000		
	After the UV treatment	1/100 ml	47		
Fecal coliforms	Before the UV treatment	1/100 ml	20,000		
	After the UV treatment	1/100 ml	7		
Enterococci	Before the UV treatment	1/100 ml	1 000		
	After the UV treatment	1/100 ml	4		
Running hours	Bank A	h	10		
	Bank B	h	8		
On and off cycles	Bank A		256		
	Bank B		275		
Remarks			• Rainy • Lamp failure • UV lamp • Number 15		

9.5 Prepare the UV system

- The UV lamps and the UV channels must be clean.
- The flow rate must be correct. For more information, see *Adjust the flowmeter* on page 77.
- The effluent in the UV channel must be disinfected for a specified time. For more information, contact the local sales and service representative.

1. Start the UV disinfection.

   For more information, see *Commissioning, Startup, Operation, and Shutdown* on page 76.

   After the UV system starts, the following conditions must be checked:

   – All the UV lamps must turn on.

     If necessary, the defective lamps must be replaced. For more information, see *Replace the UV lamps* on page 91.

   – There are no warnings of low UV intensity. For more information, see *Troubleshooting* on page 107.

2. Stop the UV disinfection.

   For more information, see *Commissioning, Startup, Operation, and Shutdown* on page 76.

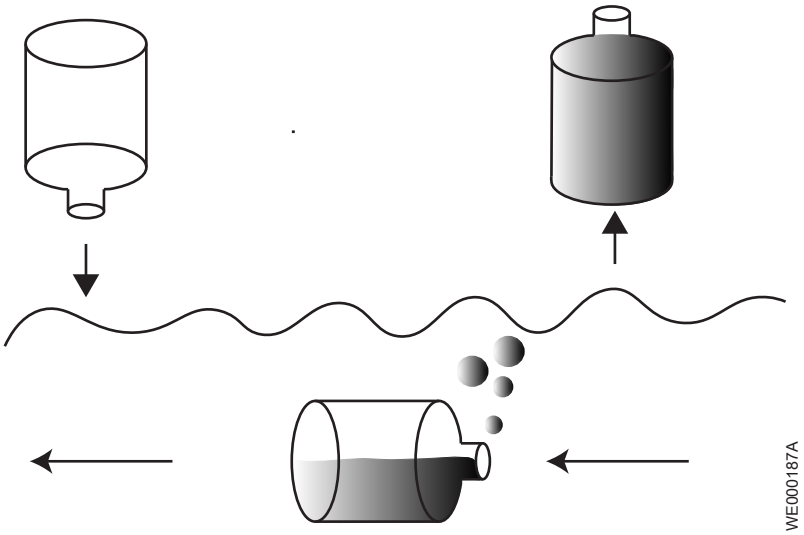
9.6 Sample collection

Requirements

- The samples must be collected from the UV channel before and after UV treatment.
- During the sample collection, the bottle must not touch the parts of the UV system in the UV channel.

9.6.1 Collect the sample: Manually

1. Remove the bottle cap.
   The inner surface or the neck of the bottle must not be touched.
2. Lower the bottle into the UV channel.
   The bottle must be lowered to a minimum depth of 30 cm (11.8 in).
3. Hold the bottle in the opposite direction of the water flow.
   The bottle must stay submerged until the bottle is filled completely.



4. Quickly close the bottle.
5. Remove the bottle from the UV channel.
   After the water sample is collected, the bottle must not be refilled.

The bottle must be kept in a cooler and sent immediately to the laboratory.

9.6.2 Collect the sample: Depth sampler

1. Use the handle to lower the depth sampler into the UV channel.
   The depth sampler must be lowered to a minimum depth of 30 cm (11.8 in).
2. Open the valve of the bottle.
   The bottle must stay submerged until the bottle is filled completely.
3. Close the valve of the bottle.
4. Remove the following items:
   1. The depth sampler from the water
   2. The bottle from the cage
5. Quickly use a cap to close the bottle.

The bottle must be kept in a cooler and sent immediately to the laboratory.

10 Troubleshooting

10.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 5 have been read and understood.

DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.

DANGER: Electrical Hazard

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.

WARNING: Crush Hazard

The automatic wiper or the penstock can operate automatically. Stay clear of the automatic wiper or the penstock when the UV system is in operation.

WARNING: Crush Hazard

If the UV module is not attached safely, it can fall down. Set the safety lock pins in the locked position before the maintenance of the UV module starts. Install the safety block before the maintenance below the UV module starts. Do not remove the safety lock pins and safety block during maintenance.

WARNING: Fall Hazard

Falls into the UV channel can cause serious injuries. Always keep the channel covers closed.

CAUTION: Ultraviolet (UV) Light Hazard

UV light can burn the eyes and the skin. Never operate the UV lamps outside the UV system. Use personal protective equipment.

CAUTION: Thermal Hazard

The surfaces or parts of the unit may become hot during operation. Allow surfaces to cool before starting work, or wear heat-protective clothing.

CAUTION: Entanglement Hazard

Loose clothing can entangle in the shaft that rotates. Do not wear loose clothing.

NOTICE:

UV lamps and quartz sleeves are fragile. These parts must be handled carefully.

NOTICE:

The operator must make sure that the water level in the UV channel stays constant. The UV module must not be submerged.

NOTICE:

The operator must not climb on the UV channel cover or put anything on it.

NOTICE:

The UV system must not be turned on and off more than four times in a 24-hour operating period.

Personal protective equipment

NOTICE:

- Safety gloves
- Safety footwear
- UV protective safety goggles or UV protective face shield

10.2 Warning

During the UV disinfection process, the UV system generates warnings for issues that have minor effects on the UV disinfection process. The operator must acknowledge these warnings.

10.2.1 Air pressure, low

This warning is applicable to the pneumatic wiper.

Symptom and cause	UV system action	Remedy
The pressure switch trips when the air pressure is low. Causes: • There is a leak in the air line. • An isolation valve in the air line is closed. • The power supply of the air compressor has tripped or turned off. • The air compressor is defective.	• The yellow LED lights up. • The event message appears. • The warning resets automatically after the normal air pressure is restored.	Check these items: • Air line – If there are leaks, repair them. – If there is blockage, remove it. • Isolation valves – If they are closed, open them. • Air compressor – If the power supply to the air compressor is turned off, turn on the power supply. – If the air compressor is defective, repair or replace it. For more information, contact the local sales and service representative.

10.2.2 Air Compressor Failure

This warning is applicable to the pneumatic wiper.

Symptom and cause	UV system action	Remedy
The air compressor is overloaded. Causes: • The circuit breaker of the air compressor has tripped. • The air compressor fuses are blown.	• The yellow LED lights up. • The event message appears. • The warning resets automatically after the cause of failure is resolved.	Check these items of the air compressor: • Electrical wiring – If there is a short circuit, repair the electrical wiring. For more information, contact the local sales and service representative. • Circuit breaker – If the circuit breaker has tripped, reset it. • Fuses – If the fuses are blown, replace them.

10.2.3 Flow/Lamp is too high

This warning is applicable when the disinfection method is **NWRI** or **UVDGM**.

Symptom and cause	UV system action	Remedy
The water flow rate for each UV lamp is more than the maximum flow limit.	• The yellow LED lights up. • The event message appears. • The UV system increases the power of the UV banks to 100%. • The warning resets automatically after the flow rate for each UV lamp is less than the maximum flow limit.	Check these items: • Water flow rate – If the water flow rate is more than the **Max. Design Flow** setpoint, decrease the water flow rate. • Flowmeter – If the flowmeter reading or signal calibration is incorrect, calibrate it correctly. For more information, see *Adjust the flowmeter* on page 77.

10.2.4 Flow Rate Low

This warning is applicable when the water flow source is from one of the following flow sources:

- 4-20 mA
- Ultrasonic sensor at the weir

- SCADA
- Penstock

Symptom and cause	UV system action	Remedy
• The water flow rate is less than the low alarm limit for more than 60 minutes. • The UV lamps are exposed to too much heat.	• The yellow LED lights up. • The event message appears. • The warning resets automatically after the flow rate for each UV lamp is more than the **Min. Design Flow** setpoint.	• If the water flow rate is less than the **Min. Design Flow** setpoint, increase the water flow rate.

10.2.5 Bank A: UV Intensity Low

This warning is similar for Bank B, Bank C, and Bank D.

There is no warning when the UV system is in maintenance mode.

Symptom and cause	UV system action	Remedy
For **PSS**: The UV intensity is less than the low warning limit at 100% UV bank power for 300 seconds. For **NWRI**, and **UVDGM**: The UV intensity is less than the warning setpoint for 300 seconds. Causes: • The UV lamps are near the end-of-lamp life. • The UV lamps near the UV sensor have failed. • The wiper rings are worn out. • The UV sensor and the quartz sleeves are dirty.	• The yellow LED lights up. • The event message appears. • The warning resets automatically when the UV intensity is more than the warning limit.	Check these items: • Water quality – If the water is turbid, do the necessary steps to improve the water quality. • Automatic wiping system – If the automatic wiping does not clean the quartz sleeves correctly, do these steps: – Decrease the wiping interval. – Increase the number of wipes in a wiping cycle. – If the wiper rings are worn out, replace them. For more information, see *Replace the wiper rings* on page 93. • UV modules – If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. – UV sensor and quartz sleeves If the UV sensor and the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • UV lamp parameters – **Bank Operating Hours** If the UV lamp hours are more than the maximum operation hours, replace the UV lamps. – **Bank ON/OFF Cycles** If the operation cycles of the UV lamp are more than the maximum operation cycles, replace the UV lamps. For more information, see *The Bank A status screen* on page 60 and *Replace the UV lamps* on page 91.

10.2.6 Bank A: Failure Lamp

This warning is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
At least one UV lamp in the UV bank is defective. Causes: • The UV lamp has failed. • The electronic ballast has failed.	• The yellow LED lights up. • The event message appears. • The warning resets automatically after the UV lamp is replaced.	• If the following electrical connections are incorrect, connect them correctly: – The UV lamp cables to the electronic ballast – The UV ballasts to the flexible circuit board • If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. • If the electronic ballast is defective, replace it. For more information, contact the local sales and service representative.

10.2.7 Bank A: Lamp Hours

This warning is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The UV lamp hours that are used are more than the specified hours in the warranty.	• The yellow LED lights up. • The event message appears.	• Replace all the UV lamps of the UV bank. For more information, see *Replace the UV lamps* on page 91.

10.2.8 Lift Device Failed

This warning is applicable to the electric lift.

Symptom and cause	UV system action	Remedy
The electric lift of the UV module failed. Causes: • The lift motor or drive has failed. • The power supply to the lift control cabinet has failed.	• The yellow LED lights up. • The event message appears. • The warning automatically resets after the drive fault is resolved.	Check these items: • Lift motor and gears – If the lift motor is defective, repair or replace it. For more information, contact the local sales and service representative. – If the gear mechanism is blocked, remove the blockage. • Module lift drive – If the module lift drive is defective, repair or replace it. For more information, contact the local sales and service representative. • Lift control cabinet – If there is no power supply, connect the power supply. After all the causes are resolved, the reset push button at the lift control cabinet must be pressed to reset the drive.

10.2.9 Surge Suppr Fail

Symptom and cause	UV system action	Remedy
A power spike or power surge occurred.	• The yellow LED lights up. • The event message appears. • The warning resets automatically after the power surge suppressor is replaced.	• If the power supply or power distribution of the following items is incorrect, correct it: – UV system – Internal components • If these items are damaged, replace them: – Surge suppressor – Damaged components because of power surge For more information, contact the local sales and service representative.

10.2.10 Too many ON/OFF cycles, Bank A

This warning is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The UV bank is turned on or turned off more than four times in 24 hours of operation.	• The yellow LED lights up. • The event message appears.	• Decrease the fluctuations of the water flow. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.2.11 UVT Too High

This warning is applicable when there is a UVT monitor.

Symptom and cause	UV system action	Remedy
The UV transmittance is more than the maximum validated limit.	• The yellow LED lights up. • The event message appears. • The warning resets automatically when the UV transmittance is less than the maximum validated limit.	Check these items: • Water quality – If the water is clear, reset the warning. No further action is necessary. • UVT monitor – If the UVT monitor calibration is incorrect, calibrate it correctly. For more information, see the UVT manual in the binder.

10.2.12 UVT Low

This warning is applicable when there is a UVT monitor.

Symptom	UV system action	Remedy
The UV transmittance is less than the **Min. Design UVT** setting for more than 300 seconds.	• The yellow LED lights up. • The event message appears. • The warning resets automatically when the UV transmittance is more than the **Min. Design UVT** setting.	Check these items: • Water quality – If the water is turbid, do the necessary steps to improve the water quality. • UVT monitor – If the UVT monitor calibration is incorrect, calibrate it correctly. For more information, see the UVT manual in the binder.

10.2.13 Wiper A-1 Failed

This warning is applicable for the electric wiper and is similar for Bank B, Bank C, and Bank D and the related UV modules.

Symptom and cause	UV system action	Remedy
The wiper controller of the UV module has failed. Causes: • The wipers are blocked. • The wiper control cabinet has failed.	• The yellow LED lights up. • The event message appears. • The EcoTouch skips the wiping sequence of the UV module. • The EcoTouch stops the wiper function of the UV bank.	Check these items: • Wiper – If the wiper mechanism is blocked, remove the blockage. • Quartz sleeves – If the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • Wiper controller – If the power supply is disconnected, connect it. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.2.14 Wiper A: Forwards Failure

This warning is applicable to the pneumatic wiper and is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The wiper of the UV bank does not reach the end position during the operation. Causes: • The wipers are blocked. • The reed switch at the end position of the wiper is defective. • There is a leak in the air line. • The air compressor is defective.	• The yellow LED lights up. • The event message appears. • The EcoTouch skips the wiping sequence of the UV module. • The EcoTouch stops the wiper function of the UV bank.	Check these items: • Wiper – If the wiper mechanism is blocked, remove the blockage. • Quartz sleeves – If the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83. • Reed switch – If the reed switch is defective, replace it. • Air compressor – If there are leaks, repair them. – If the air compressor is defective, repair or replace it. For more information, see the air compressor manual. • Main isolator – If the main isolator is turned off, turn it on. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.2.15 Wiper A: Return Failure

This warning is applicable to the pneumatic wiper and is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The wiper of the UV bank does not reach the start position during the operation. Causes: • The wipers are blocked. • The reed switch at the rest position of the wiper is defective. • There is a leak in the air line. • The air compressor is defective.	• The yellow LED lights up. • The event message appears. • The EcoTouch skips the wiping sequence of the UV module. • The EcoTouch stops the wiper function of the UV bank.	Check these items: • Wiper – If the wiper mechanism is blocked, remove the blockage. • Quartz sleeves – If the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • Reed switch – If the reed switch is defective, replace it. • Air compressor – If there are leaks, repair them. – If the air compressor is defective, repair or replace it. For more information, see the air compressor manual. • Main isolator – If the main isolator is turned off, turn it on. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.2.16 Bank A: Wiper Rings

This warning is applicable to the pneumatic wiper and is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The number of wipes for the wiper rings has reached the specified maximum limit in the warranty.	• The yellow LED lights up. • The event message appears. • If the wipe count is more than 10 000, then also the warning can be removed.	• Replace the wiper rings. For more information, see *Replace the wiper rings* on page 93. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.2.17 Wiper Rings: Module A1

This warning is applicable for the electric wiper and is similar for Bank B, Bank C, and Bank D and the related UV modules.

Symptom and cause	UV system action	Remedy
The number of wipes for the wiper rings has reached the specified maximum limit in the warranty.	• The yellow LED lights up. • The event message appears. • If the wipe count is more than 10 000, then also it is possible to remove the warning.	• Replace the wiper rings. For more information, see *Replace the wiper rings* on page 93. When all the causes are resolved, the reset push button must be pressed to clear the warning.

10.3 Alarm

During the UV disinfection process, the UV system generates alarms that have major effects on the UV disinfection process. The operator must acknowledge these alarms immediately.

10.3.1 Overtemp. Cabinet

Symptom and cause	UV system action	Remedy
When the ambient temperature in the cabinet is more than 45ºC (113ºF), the switch of the high cabinet temperature trips. Causes: • There is problem with control cabinet fans. • The fans of the electronic ballasts do not operate. • The filter mats of the control cabinet are dirty or blocked. • The air conditioner is defective.	• The red LED lights up. • The event message appears. • All the UV banks are turned off.	Check these items: • Fans of the control cabinet and the electronic ballasts – If the fans do not work correctly, repair or replace them. For more information, contact the local sales and service representative. • Filter mats of the control cabinet – If the filter mats are dirty or blocked, clean them. For more information, see *Clean the filter mat* on page 102. • Air conditioner – If the air conditioner is defective, repair or replace it. For more information, contact the local sales and service representative. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.2 Flow Rate High

Symptom and cause	UV system action	Remedy
The water flow rate for the UV system is more than the **Max. Design Flow** limit for more than 60 minutes.	• The red LED lights up. • The event message appears. • All the UV banks turn on at 100% power. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off. • The alarm resets automatically when the water flow is less than the **Max. Design Flow** limit.	Check these items: • Water flow rate – If the water flow rate is more than the **Max. Design Flow** setpoint, decrease the water flow rate. • Flowmeter – If the flowmeter reading or signal calibration is incorrect, calibrate it correctly. For more information, see *Adjust the flowmeter* on page 77.

10.3.3 Signal Failure, Flow Meter

This alarm is applicable when the flow source is from the 4–20 mA signal.

Symptom and cause	UV system action	Remedy
The flow rate at **4-20 mA** signal to the EcoTouch is missing. Causes: • The analog signal wiring is disconnected. • The power supply to the flowmeter has failed. • The flowmeter is defective.	• The red LED lights up. • The event message appears. • The EcoTouch uses **Max. Design Flow** for the dose equation and is displayed on the EcoTouch. • All the UV banks turn on at 100% power. • The alarm resets automatically after the flow rate signal is restored. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • Analog signal wiring – If the wires are disconnected, connect them. • Flowmeter – If there is no power supply to the flowmeter, connect the power supply. – If the flowmeter is defective, replace it. For more information, contact the local sales and service representative.

10.3.4 Bank A: UV Intensity Low

This alarm is similar for Bank B, Bank C, and Bank D.

There is no alarm when UV system is in maintenance mode.

Symptom and cause	UV system action	Remedy
The UV intensity is less than the alarm limit at 100% ballast power. Causes: • The UV lamps are near the end-of-lamp life. • The UV lamps near the UV sensor have failed. • The wiper rings are worn out. • The UV sensor and the quartz sleeves are dirty.	• The red LED lights up. • The event message appears. • The alarm resets automatically when the UV intensity is more than the alarm limit.	Check these items: • Water quality – If the water is turbid, do the necessary steps to improve the water quality. • Automatic wiping system – If the automatic wiping does not clean the quartz sleeves correctly, do these steps: – Decrease the wiping interval. – Increase the number of wipes in a wiping cycle. – If the wiper rings are worn out, replace them. For more information, see *Replace the wiper rings* on page 93. • UV modules – If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. – If the UV sensor and the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • UV lamp parameters – **Bank Operating Hours** If the UV lamp hours are more than the maximum operation hours, replace the UV lamps. – **Bank ON/OFF Cycles** If the operation cycles of the UV lamp are more than the maximum operation cycles, replace the UV lamps. For more information, see *The Bank A status screen* on page 60 and *Replace the UV lamps* on page 91.

10.3.5 Multi-Lamp Failure, Bank A

This alarm is similar for Bank B, Bank C, and Bank D.

Symptom and cause	UV system action	Remedy
The UV lamps that failed in **Bank A** are more than the **Max. Lamps to Fail** parameter. Causes: • The UV lamps have failed. • The electronic ballast has failed.	• The red LED lights up. • The event message appears. • The UV dose for **Bank A** is set to zero. • If the UV system has more than one bank, then all UV banks turn on at 100% power. • When the **Assist** or **Standby** UV bank turns on, the **Duty** UV bank turns off after ten minutes. • If the **Assist** or **Standby** UV bank is not available, then failed UV bank stays on.	• If the following electrical connections are incorrect, connect them correctly: – The power supply to the electronic ballast – The UV lamp cables to the electronic ballast – The UV ballasts to the flexible circuit board • If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. • If the electronic ballast is defective, replace it. For more information, contact the local sales and service representative. • If the fuses of the UV bank or UV modules are blown, replace them. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.6 Penstock Breaker

This alarm is applicable to the outlet penstock.

Symptom and cause	UV system action	Remedy
The outlet penstock actuator is overloaded. Causes: • The circuit breaker for the actuator has tripped. • The fuses of the outlet penstock actuator are blown.	• The red LED lights up. • The event message appears. • The alarm resets automatically after the cause of failure is resolved.	Check these items of the outlet penstock actuator: • Electrical wiring – If there is a short circuit, repair the electrical wiring. For more information, see the outlet penstock manual in the binder. • Circuit breaker – If the circuit breaker has tripped, reset it. • Fuses – If the fuses are blown, replace them.

10.3.7 Remote Penstock

This alarm is applicable to the outlet penstock.

Symptom and cause	UV system action	Remedy
The EcoTouch does control the outlet penstock thus the outlet penstock on the actuator operates manually. Causes: • The **Local** or **Remote** selector switch at the outlet penstock is in the **Local** position. • The power supply to the outlet penstock actuator is disconnected.	• The red LED lights up. • The event message appears. • The alarm resets automatically after the selector switch is turned to the **Remote** mode.	Check these items: • Selector switch at the outlet penstock actuator – If the position is at **Local**, change the position to **Remote**. • Power supply to the outlet penstock actuator – If the power supply is disconnected, connect it. For more information, see the outlet penstock manual in the binder.

10.3.8 Penstock, not OK

This alarm is applicable to the outlet penstock.

Symptom and cause	UV system action	Remedy
Causes: • The outlet penstock actuator has failed. • The outlet penstock cannot move. • The power supply to the actuator is turned off or has tripped. • The phase sequence is incorrect.	• The red LED lights up. • The event message appears.	Check the outlet penstock for local alarms. • If the power supply to the outlet penstock is disconnected, connect the power supply. • If the phase sequence of the outlet penstock actuator is incorrect, correct the phase sequence. • If the outlet penstock actuator is defective, repair or replace it. For more information, see the outlet penstock manual in the binder. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.9 Penstock, cannot close

This alarm is applicable to the outlet penstock and when **Torque Alarm** is enabled.

Symptom and cause	UV system action	Remedy
The outlet penstock cannot close. Causes: • The actuator is stuck. The torque limit of the actuator is more than the close torque limit.	• The red LED lights up. • The event message appears.	Check the outlet penstock for local alarms. • If the outlet penstock mechanism is blocked, remove the blockage. • Open the outlet penstock locally to reset **Torque Alarm**. For more information, see the penstock manual in the binder. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.10 Penstock, cannot open

This alarm is applicable to the outlet penstock and when **Torque Alarm** is enabled.

Symptom and cause	UV system action	Remedy
The outlet penstock cannot open. Causes: • The actuator is stuck. The torque limit of the actuator is more than the open torque limit.	• The red LED lights up. • The event message appears.	Check the outlet penstock for local alarms. • If the outlet penstock mechanism is blocked, remove the blockage. • Close the outlet penstock locally to reset **Torque Alarm**. For more information, see the penstock manual in the binder. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.11 Penstock Position

This alarm is applicable to the outlet penstock and when the **Position Feedback** option is enabled.

Symptom and cause	UV system action	Remedy
The **4-20 mA** signal for the outlet penstock position to the EcoTouch is not available for 30 seconds. Causes: • The analog signal wiring is disconnected. • The outlet penstock actuator is defective. • The power supply to the actuator has failed.	• The red LED lights up. • The event message appears. • The EcoTouch uses **Max. Design Flow** for the dose equation and is displayed on the EcoTouch. • All the UV banks turn on at 100% power. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • Analog signal wiring – If the wires are disconnected, connect them. • Outlet penstock actuator – If the outlet penstock actuator is defective, replace it. – If there is no power supply to the outlet penstock actuator, connect the power supply. For more information, see the penstock manual in the binder. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.12 RED Low

This alarm is applicable when the disinfection method is **NWRI** or **UVDGM**. There is no alarm when the UV system is in maintenance mode.

Symptom and cause	UV system action	Remedy
The calculated RED is lower than the defined **Min. Design RED** setting. Causes: • The UV lamps are near the end-of-lamp life. • The UV lamps near the UV sensor have failed. • The UV sensor and the quartz sleeves are dirty. • The wiper rings are worn out. • The UV transmittance is too low.	• The red LED lights up. • The event message appears. • The UV system increases the power of the UV bank to 100%. • All the UV banks turn on at 100% power. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • UV modules – If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. – If the UV sensor and the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • UV lamp parameters – **Bank Operating Hours** If the lamps hours are more than 14 000 hours, replace the UV lamps. – **Bank ON/OFF Cycles** If the operation cycles of the UV lamp are more than the maximum operation cycles, replace the UV lamps. For more information, see *The Bank A status screen* on page 60 and *Replace the UV lamps* on page 91. • Automatic wiping system – If the automatic wiping does not clean the quartz sleeves correctly, do these steps: – Decrease the wiping interval. – Increase the number of wipes in a wiping cycle. – If the wiper rings are worn out, replace them. For more information, see *Replace the wiper rings* on page 93. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.13 UV Dose Low

This alarm is applicable when the disinfection method is **PSS**.

Symptom and cause	UV system action	Remedy
The UV dose is less than the **Min. Design Dose** or the UV disinfection is less than the disinfection target. Causes: • The UV lamps are near the end-of-lamp life. • The UV lamps near the UV sensor have failed. • The UV sensor and the quartz sleeves are dirty. • The wiper rings are worn out. • The UV transmittance is too low.	• The red LED lights up. • The event message appears. • The UV system increases the power of the UV bank to 100%. • All the UV banks turn on at 100% power. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • UV modules – If the UV lamps are defective, replace them. For more information, see *Replace the UV lamps* on page 91. – If the UV sensor and the quartz sleeves are dirty, clean them. For more information, see *Clean the transparent surfaces* on page 83 and *Clean the UV module manually* on page 91. • UV lamp parameters – **Bank Operating Hours** If the lamps hours are more than 14 000 hours, replace the UV lamps. – **Bank ON/OFF Cycles** If the operation cycles of the UV lamp are more than the maximum operation cycles, replace the UV lamps. For more information, see *The Bank A status screen* on page 60 and *Replace the UV lamps* on page 91. • Automatic wiping system – If the automatic wiping does not clean the quartz sleeves correctly, do these steps: – Decrease the wiping interval. – Increase the number of wipes in a wiping cycle. – If the wiper rings are worn out, replace them. For more information, see *Replace the wiper rings* on page 93. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.14 Safety Relay A

This alarm is similar for **Safety Relay B**, **Safety Relay C**, and **Safety Relay D**.

Symptom and cause	UV system action	Remedy
The safety relay has tripped. Causes: • A UV module is lifted. • A UV module cover is open.	• The red LED lights up. • The event message appears. • **Bank A** turns **Off**. All the UV banks turn on at 100% power. • When the safety relay is reset, the following actions occur: – The **Duty** or **Assist** UV bank turns on. – The **Standby** UV bank turns off.	Check the UV module. • If the UV module is lowered partially, lower it completely. • If the UV module connectors are not connected, connect them. When all the causes are resolved, the reset push button must be pressed to clear the alarm.

10.3.15 SCADA Comm. Fail

This alarm is applicable when the water flow source is from **SCADA**.

Symptom and cause	UV system action	Remedy
The EcoTouch does not get the information from SCADA system. Thus the EcoTouch does not receive the water flow rate. Causes: • The **SCADA** PLC has failed. • The communications cable is disconnected or damaged.	• The red LED lights up. • The event message appears. • The EcoTouch uses **Max. Design Flow** for the dose equation and is displayed on the EcoTouch. • All the UV banks turn on at 100% power. • The alarm resets automatically after **SCADA** communications are restored. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	• Check that there is communication between the EcoTouch controller and **SCADA** PLC. • Check the communication cable: – If the communication cable is damaged, repair or replace it. For more information, contact the local sales and service representative. – If the communication cable is disconnected, connect it. • If the **SCADA** PLC is defective, repair or replace it. For more information, contact the local sales and service representative.

10.3.16 Signal Failure, US-1

This alarm is applicable to the outlet penstock.

Symptom and cause	UV system action	Remedy
The **4-20 mA** signal to EcoTouch is not available. Causes: • The power supply to the ultrasonic sensor has failed. • The ultrasonic level sensor is defective. • The analog signal wire is disconnected. • The analog input module is defective or damaged.	• The red LED lights up. • The event message appears. • The EcoTouch stops the control on the outlet penstock and the outlet penstock that is stuck in the last position. • The alarm resets automatically after the **4-20 mA** signal is restored. .	Check these items: • Ultrasonic level sensor – If there is no power supply to the ultrasonic level sensor, connect the power supply. – If the ultrasonic level sensor is defective, replace it. For more information, see the ultrasonic sensor manual in the binder. • Analog signal wire – If the analog signal wire is disconnected, connect it. • Analog input module – If the analog input module is defective or damaged, repair or replace it. For more information, contact the local sales and service representative.

10.3.17 Signal Failure, US 2

This alarm is applicable to the flow source that is installed with ultrasonic sensor at the weir or outlet penstock.

Symptom and cause	UV system action	Remedy
The **4-20 mA** signal to EcoTouch is not available. Causes: • The power supply to the ultrasonic sensor has failed. • The ultrasonic level sensor is defective. • The analog signal wire is disconnected. • The analog input module is defective or damaged.	• The red LED lights up. • The event message appears. • All the UV banks turn on at 100% power. • The EcoTouch uses **Max. Design Flow** for the dose equation and is displayed on the EcoTouch. • The alarm resets automatically after the **4-20 mA** signal is restored. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • Ultrasonic level sensor – If there is no power supply to the ultrasonic level sensor, connect the power supply. – If the ultrasonic level sensor is defective, replace it. For more information, see the ultrasonic sensor manual in the binder. • Analog signal wire – If the analog signal wire is disconnected, connect it. • Analog input module – If the analog input module is defective or damaged, repair or replace it. For more information, contact the local sales and service representative.

10.3.18 Signal Failure, UVT

This alarm is applicable when there is a UVT monitor.

Symptom and cause	UV system action	Remedy
The UVT **4-20 mA** signal to the EcoTouch is not available. Causes: • The power supply to the UVT monitor has failed. • The UVT monitor has failed or is defective. • The analog signal wire is disconnected. • The analog input module is defective or damaged.	• The red LED lights up. • The event message appears. • The EcoTouch assumes the **Min. Design UVT** for the UV dose equation. • The alarm resets automatically after the UVT signal is restored.	Check these items: • UVT monitor – If there is no power supply to the UVT monitor, connect the power supply. – If the UVT monitor is defective, replace it. For more information, see the UVT monitor manual in the binder. • Analog signal wire – If the analog signal wire is disconnected, connect it. • Analog input module – If the analog input module is defective or damaged, repair or replace it. For more information, contact the local sales and service representative.

10.3.19 UVT Very Low

This alarm is applicable when there is a UVT monitor.

Symptom and cause	UV system action	Remedy
The UVT is less than the minimum design limit.	• The red LED lights up. • The event message appears. • The UV system increases the power of the UV bank to 100%. • All the UV banks turn on at 100% power. • When the alarm is cleared, the following actions occur: – The EcoTouch returns to the **Duty** or **Assist** mode. – The **Standby** bank turns off.	Check these items: • Water quality – If the water is turbid, do the necessary steps to improve the water quality. • UVT monitor – If the UVT monitor calibration is incorrect, calibrate it correctly. For more information, see the UVT monitor manual in the binder.

10.3.20 Water level low

This alarm is applicable when the water flow source is from **SCADA**.

Symptom and cause	UV system action	Remedy
The water level in the UV channel is less than the low alarm limit. Causes: • The water flow rate is too low. • The low-level probe is defective or damaged.	• The red LED lights up. • The event message appears. • The UV bank in the UV channel switches off. • After the alarm is cleared, the UV lamps turns on. • The alarm resets automatically after the water level is restored.	Check these items: • Water flow rate – If the water flow rate is low, correct the water flow rate. • Low-level probe – If the low-level probe is defective, replace it. • Outlet penstock, if applicable – If the outlet penstock does not work correctly, repair it. For more information, see the outlet penstock manual in the binder.

10.3.21 24 V Power Supply failed

Symptom and cause	UV system action	Remedy
• The power supply unit of 24 VDC shows an error. • The power supply unit of 24 VDC is not able to energize the UV bank contactors. • The UV banks turn OFF. Causes: • The circuit breaker or fuse has tripped or is turned off. • There is a short-circuit in the 24 VDC power supply. • The 24 VDC power supply is defective.	• The red LED lights up. • The event message appears. • The UV bank turns off. • After the alarm is cleared, the UV lamps turn on. • The alarm resets automatically after the 24 V power is restored.	Check these items: • 24 V circuit – If there is a short circuit, repair the electrical wiring. For more information, contact the local sales and service representative. • Power supply unit, 24 VDC – If there is no 24 VDC power supply, connect it. – If the circuit breaker has tripped, reset it. – If the fuse has blown, replace it.

11 Other Relevant Documentation or Manuals

11.1 Reference documents

The following documents are included in the binder:

Category	Name
Storage guidelines	UV System - Storage and Handling Guidelines STDS-003
Drawings	• General Arrangement Drawing • Mounting Instruction UV Module • Installation Low-Level Probe • Installation Ultrasonic Sensor • Installation Lift Control Cabinet, optional • Installation Wiper Control Cabinet, optional • Installation Pipe Weir, optional • Installation Compressor, optional • Pneumatic Diagram, optional
Electrical	• Wiring Diagram • Cable List Overview • External Cabinet Layout • Internal Cabinet Layout • Electrical Part List • SOP lamp Cable Wiring Procedure
Certificates	• UV Sensor Certificate • Declaration of Conformity • Certificates Management System
Production	• Packing List • Test Report
Spare parts	Spare parts list_Duron

The project-specific vendor documents are included in the binder as a CD-ROM or a USB drive.

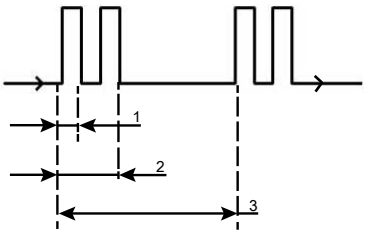
12 Glossary

12.1 Terms

Term	Description
absorbance	The measurement of UV light amount which is absorbed by water, microbial DNA, bulb envelope, and quartz sleeve at a specific wavelength This measurement explains absorption and dispersion in the medium. Typical units: m^{-1}, cm^{-1}
BOL	Beginning of life
downward opening penstock (DOP)	It is also known as downward opening weir gate. DOP is used for water level control in the UV channel.
dose response	The level of inactivation of a microorganism because of the UV dose Inactivation = $\log_{10}(N_0/N)$ N_0 = the number of microorganisms present before UV light exposure N = the number of microorganisms present after UV light exposure
disinfection	The process that stops or inactivates harmful microorganisms
electronic ballast cabinet	A cabinet that contains the electronic ballasts
electronic ballast	A device that is installed in the control cabinet and controls the UV lamps
EOL	End-of-life
EcoTouch	A Wedeco proprietary equipment In standard systems, the EcoTouch display is used as a UV controller and an HMI. In customized systems with a PLC, the EcoTouch display is used as a gateway controller between the PLC and the electronic ballast interface. The EcoTouch is installed on the door of the control cabinet, or inside the electronic ballast cabinet, depending on the configuration of the UV system.
flow rate	The volume of water that passes through the UV channel and comes into contact with UV light for a time period The volume is fixed and the flow rate changes. The flow rate must not be more than the design flow rate. Flow rate = volume per residence time
Flex board	This is a flexible circuit board that distributes the three-phase voltage, neutral, and also the digital bus to six TDS ballasts. The board monitors the operational status of the electronic ballasts for each rack and communicates with EcoTouch.
fouling	The buildup of dissolved materials on the surface of the quartz sleeves and the UV sensor. This buildup decreases the effectiveness of the UV disinfection.
HMI	Human-machine interface A screen that shows information and allows the site operator to interact with the UV system In standard systems, the EcoTouch display is used as a UV controller and an HMI. In customized systems with a PLC, any screen that is connected to the PLC is used as an HMI.
irradiated volume	The volume of UV banks in which water is exposed to UV light.
J/m²	Joule per square meter
L/O/R	Local-Off-Remote

Term	Description
low-level probe	A low-level probe that protects the UV lamps from overheating when the water level is insufficient The low-level probe is installed downstream in the last UV bank in the UV channel.
lamp aging	A decrease in the UV intensity of the UV lamps depends on the operating hours, and the operational conditions.
lamp power	The electric power consumption of a UV lamp
mA	Milliampere
main isolator	A disconnector from the mains to isolate from the power supply
minimum UV dose	The minimum UV dose that is necessary to maintain the necessary disinfection
mW/cm²	Milliwatt per square centimeter
normal operation	Independent and automatic operation
nm	Nanometer
online UVT monitor	The monitoring instrument in the UV channel which measures the real-time values of UV transmission in the water for UV light
OOS	Out of service
outlet penstock	A weir gate that is installed in the outlet of the UV channel, see downward opening penstock (DOP)
PSU	Power supply unit
PSS	Point source summation Computer-aided modeling that calculates the performance of the UV system
quartz sleeve	A quartz tube that surrounds and protects the UV lamps The quartz sleeves have direct contact with water.
residence time	The amount of time that the microorganisms are in contact with UV light. Residence time of each bank = Irradiated UV bank volume ÷ water flow rate in the UV channel
RED	Reduction Equivalent Dose The calculated dose at a specific operational condition that is based on biodosimetry
running hours	The operating hours of the UV lamps
SCS	Supervisory control system
SCADA	Supervisory control and data acquisition A plant-wide control system which interacts with the UV system
target dose	The adjustable setpoint of the UV controller which is compared to the calculated UV dose Target dose = Minimum UV dose + Safety margin
target intensity	The adjustable setpoint of the UV controller which is compared to the actual UV intensity Target intensity = Minimum UV intensity + Safety margin
TERD board	This board is a Wedeco specific I/O module that distributes the following inputs and outputs to the EcoTouch: • Discrete inputs • Discrete outputs • Analog inputs • Analog outputs
UPS	Uninterruptible power supply Ensuring the supply of electrical loads in the event of faults
UV	Ultraviolet

Term	Description
UV controller	A microprocessor-controlled computer that automates the electro-mechanical processes The computer continuously monitors the state of the input and output devices to make decisions based on a program logic. The standard systems use EcoTouch and the customized systems use a PLC.
UV dose	The amount of UV light that is used to get the required disinfection 1 J/m² = 0.1 mJ/cm² = 0.1 mW-s/cm²
UV intensity	The power for each surface unit The magnitude of UV light in the UV bank is 1 W/m² = 0.1 mW/cm².
UV lamp	A lamp that emits UV light in the UVC range
UV light	The electromagnetic radiation that has a wavelength between 200 nm and 400 nm In this manual, UV light refers to light that has a wavelength of 254 nm.
UV sensor	A photodetector that measures the UV intensity at a single point in the UV bank
UV system	Equipment that uses UV light to disinfect water
UV transmittance	The ratio of UV light that enters the water compared to the UV light that leaves the water The lower the UV transmittance, the more UV intensity is required for the same UV dose with the same flow. %UVT = 100 x 10^{-A}, where A = Absorbance
UVDGM	Ultraviolet Disinfection Guidance Manual
UV channel	A channel that exposes water to UV light The UV channel has the following main components: • UV banks which include the UV modules • Low-level probe • Outlet weir for level control
UV bank	Each UV bank consists of one or more UV modules. Several UV banks installed serially in one UV channel. The UV banks in the UV channel are identified alphabetically A, B, C, D from the UV channel inlet.
UV module	A UV module holds the UV lamps in the UV channel. The UV module has the following main components: • UV lamp modules • Wiping system • UV sensor The UV modules in the UV bank are identified numerically as 1–4.
UV lamp module	UV lamp module consists of the following components: • Quartz sleeves • UV lamp • Electrical connector The UV lamp module gives UV light that disinfects the water. For more information, see *UV lamp module* on page 17
wiper control cabinet	A wiper control cabinet contains the controls of the automatic wiping system The wiper control cabinet is installed next to the UV channel, close to the corresponding UV bank.
W/m²	Watt per square meter

Term	Description
wiping cycle	One cycle = Two strokes of the wiper between the following positions: • Start position to the end position • End position to the start position  1. Wiping 2. Wiping cycle 3. Wiping interval
wiping interval	The time between two wiping cycles
wiper arm	The mechanical assembly of the UV module which moves the wiper rings over the quartz sleeves
wiper blade	The wiper blade on the wiper cleans the UV sensor.

Xylem |’zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We’re a global team unified in a common purpose: creating advanced technology solutions to the world’s water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

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