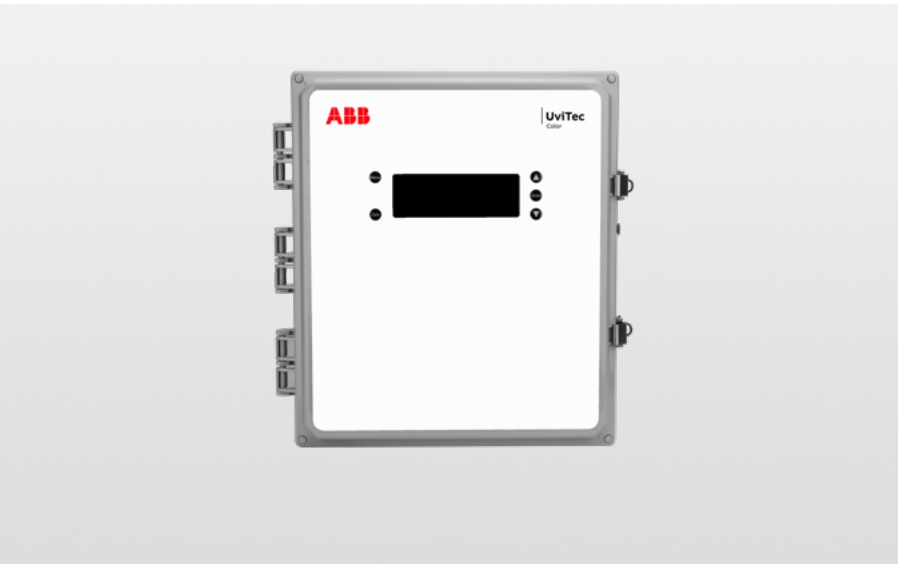
UviTec™
Analyzers



UviTec
Analyzers

Introduction

This operating instruction provides the operating, maintenance, and troubleshooting procedures for the UviTec range of analyzers.

This operating instruction applies to the analyzers that follow:

- Color
- Nitrite
- UV254

For more information

Further publications for UviTec products are available for free download from:
abb.com/wateranalysis
or by scanning this code:

Links and reference numbers for related documents:

	Search for/click:
UviTec Color Analyzer – Data sheet	DS/AUV201
UviTec Nitrite Analyzer – Data sheet	DS/AUV202
Uvitec UV254 Analyzer – Data sheet	DS/AUV204
UviTec Analyzers – Commissioning instruction	CI/AUV200
UviTec Dual Feed – Operating instruction	OI/UVITEC/DUALFEED

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1 Health and safety

1.1 Document symbols

Symbols that appear in this document are explained below:

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Note:
Indicates operator tips, particularly useful information or important information about the product or its further uses.

1.2 Safety precautions

⚠ WARNING

Optical radiation

This analyzer contains an LED light, which emits light at visible (VIS) wavelengths. Do not look directly at the light because it could cause permanent eye damage and burn unprotected skin.

⚠ WARNING

Electricity hazard

Disconnect the power supply to the analyzer before you do maintenance on the analyzer.

⚠ WARNING

Improper use of this device may cause injury.

Visually examine the analyzer before installation. If the quartz flow cell or LED light is broken or damaged, do not use it. Contact ABB for replacement parts.

Make sure that all responsible personnel carefully read this manual before installing or servicing the device.

Failure to properly install and maintain this device may impact its effectiveness and warranty.

1.3 Product symbols

Symbols that may appear on this product are shown below:

⎓ Direct current supply only.


This symbol identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.


This symbol indicates the need for protective eye wear.


This symbol indicates the need for protective hand wear.


Recycle separately from general waste under the WEEE directive.

1.4 Product recycling and disposal (Europe only)


ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive that initially came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment, and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment. In conformity with European local and national regulations, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

NOTICE

For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

1.5 Information on RoHS Directive 2011/65/EU (RoHS II)



ABB, Process Automation, Measurement & Analytics, fully supports the objectives of the RoHS II directive. All in-scope products placed on the market by PAMA on and following the 22nd of July 2017, will be compliant to the RoHS directive, 2011/65/EU.

2 Operator interface

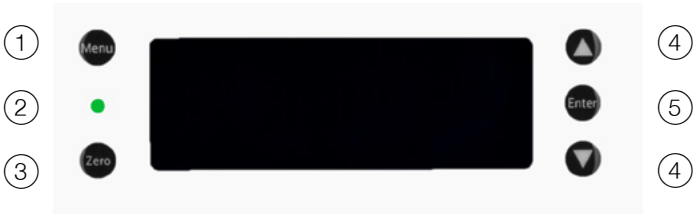


Figure 1 Operator interface

Table 1 Operator interface descriptions

Item	Description	Function
1	**Menu** button	Press to access the menu
2	Indicator light	• Green: Normal operation • Yellow: Warning • Red: Fault
3	**Zero** button	Press to calibrate
4	Up/down buttons	Cycle through the menu
5	**Enter** button	Press to access menu options

3 Menu structure

3.1 Averaging

Menu	Description	Default
On: 1 Off: 0		
Average	Press **Enter** then ▲/▼ to select running average for last 10 readings	0: Off

3.2 Units

3.2.1 Color C2000 & C4000

Menu	Description	Default
0: %T		
1: Abs		
2: Color mode		
Select	Press **Enter** then ▲/▼ to select %T, Abs, or Color mode	0: %T (C2000) 2: Color (C4000)

3.2.2 Nitrite N2000

Menu	Description	Default
0: %T		
1: Abs		
2: Nitrite		
Select	Press **Enter** then ▲/▼ to select %T, Abs, or Correlation mode	0: %T

3.2.3 UV254 M2000

Menu	Description	Default
0: UVT		
1: UVA		
2: Crltn. Mode		
Select	Press **Enter** then ▲/▼ to select UVT, UVA, or Correlation mode	0: UVT

3.3 Set points

3.3.1 Color C2000 & C4000

Menu	Description	Default
%T warning	Press **Enter** then ▲/▼ to select %T warning set point	75
%T alarm	Press **Enter** then ▲/▼ to select %T alarm set point	50
Abs warning	Press **Enter** then ▲/▼ to select Abs warning set point	0.20
Abs alarm	Press **Enter** then ▲/▼ to select Abs alarm set point	0.30
Color warning	Press **Enter** then ▲/▼ to select the Color warning set point	4000 (C2000) 160 (C4000)
Color alarm	Press **Enter** then ▲/▼ to select the Color alarm set point	5000 (C2000) 200 (C4000)

3.3.2 Nitrite N2000

Menu	Description	Default
%T warning	Press **Enter** then ▲/▼ to select %T warning set point	75
%T alarm	Press **Enter** then ▲/▼ to select %T alarm set point	50
Abs warning	Press **Enter** then ▲/▼ to select Abs warning set point	0.20
Abs alarm	Press **Enter** then ▲/▼ to select Abs alarm set point	0.30
Nitrite warning	Press **Enter** then ▲/▼ to select the Nitrite warning set point	160
Nitrite alarm	Press **Enter** then ▲/▼ to select the Nitrite alarm set point	200

…3 Menu structure

…Set points

3.3.3 UV254 M2000

Menu	Description	Default
UVT warning	Press **Enter** then ▲/▼ to select UVT warning set point	75
UVT alarm	Press **Enter** then ▲/▼ to select UVT alarm set point	50
UVA warning	Press **Enter** then ▲/▼ to select UVA warning set point	0.20
UVA alarm	Press **Enter** then ▲/▼ to select UVA alarm set point	0.30
Crltn. warning	Press **Enter** then ▲/▼ to select the correlation warning set point	160
Crltn. alarm	Press **Enter** then ▲/▼ to select the correlation alarm set point	200

3.4 4-20 mA setup

3.4.1 Color C2000 & C4000

Menu	Description	Default
4 mA %T	Press **Enter** then ▲/▼ to select 4 mA %T reading for scaling	0
20 mA %T	Press **Enter** then ▲/▼ to select 20 mA %T reading for scaling	100
4 mA Abs	Press **Enter** then ▲/▼ to select 4 mA Abs reading for scaling	0
20 mA Abs	Press **Enter** then ▲/▼ to select 20 mA Abs reading for scaling	1
4 mA color	Press **Enter** then ▲/▼ to select 4 mA correlation reading for scaling	0
20 mA color	Press **Enter** then ▲/▼ to select 20 mA correlation reading for scaling	5000 (C2000 200 (C4000)

3.4.2 Nitrite N2000

Menu	Description	Default
4 mA %T	Press **Enter** then ▲/▼ to select 4 mA %T reading for scaling	0
20 mA %T	Press **Enter** then ▲/▼ to select 20 mA %T reading for scaling	100
4 mA Abs	Press **Enter** then ▲/▼ to select 4 mA Abs reading for scaling	0
20 mA Abs	Press **Enter** then ▲/▼ to select 20 mA Abs reading for scaling	1
4 mA Nitrite	Press **Enter** then ▲/▼ to select 4 mA correlation reading for scaling	0
20 mA Nitrite	Press **Enter** then ▲/▼ to select 20 mA correlation reading for scaling	200

3.4.3 UV254 M2000

Menu	Description	Default
4 mA UVT	Press **Enter** then ▲/▼ to select 4 mA UVT reading for scaling	0
20 mA UVT	Press **Enter** then ▲/▼ to select 20 mA UVT reading for scaling	100
4 mA UVA	Press **Enter** then ▲/▼ to select 4 mA UVA reading for scaling	0
20 mA UVA	Press **Enter** then ▲/▼ to select 20 mA UVA reading for scaling	1
4 mA Crltn.	Press **Enter** then ▲/▼ to select 4 mA correlation reading for scaling	0
20 mA Crltn.	Press **Enter** then ▲/▼ to select 20 mA correlation reading for scaling	200

3.5 Secondary data

3.5.1 Color C2000 & UV254 M2000

Menu	Description
Water 1	Displays the water reading as measured in position 1
Lamp 2	Displays the lamp reading as measured in position 2
VIS lamp	Displays secondary wavelength direct output
VIS water	Displays secondary wavelength output after passing through flow cell
Temperature	Displays temperature inside cabinet – Celsius
Humidity	Displays the relative humidity inside the cabinet – RH
Status code	Displays status code for system diagnostics

3.5.2 Color C4000

Menu	Description
Water 1	Displays the water output after it passes through the flow cell
Lamp 1	Displays the direct lamp output
Water 2	Displays VIS output after passing through flow cell
Water 2	Displays VIS direct output
Temperature	Displays temperature inside cabinet – Celsius
Humidity	Displays the relative humidity inside the cabinet – RH
Status code	Displays status code for system diagnostics

3.5.3 Nitrite N2000

Menu	Description
Lamp	Displays the direct lamp output
Water	Displays the water output after it passes through the flow cell
VIS lamp	Displays VIS direct output
VIS water	Displays VIS output after passing through flow cell
Temperature	Displays temperature inside cabinet – Celsius
Humidity	Displays the relative humidity inside the cabinet – RH
Status code	Displays status code for system diagnostics

3.6 Dry contact setup

Menu	Description	Default
See "Set alarms" on page 10		
0: Nothing		
1: Alarm		
Select	Press **Enter** then ▲/▼ to select 0 or 1 to turn on/off dry contact	0 = Nothing

3.7 Cleaning system

Menu	Description	Default
Enable clean	Press **Enter** then ▲/▼ to select 0 or 1 to turn on automatic cleaning system if supplied	0
Reset clean	Press **Enter** then ▲/▼ to select 0 or 1 to reset fluid alarms after refilling fluid	0
Force clean	Press **Enter** then ▲/▼ to select 0 or 1 to force the cleaning system to begin a cleaning cycle	0
Pumping time	C2000: Press **Enter** then ▲/▼ to select pump timing 1, 2, 3 (90, 120, 180 seconds)	2
	C4000 & N2000: Press **Enter** then ▲/▼ to select pump timing 1, 2, 3 (200, 210, 220 seconds)	2

...3 Menu structure

3.8 Clean frequency

3.8.1 Color C2000 & UV254 M2000

Menu	Description	Default
0: No cleaning		
1: 30 mins		
2: 1 hour		
3: 2 hours		
4: 4 hours		
5: 12 hours		
6: 1 day		
7: 2 days		
Select	Press **Enter** then ▲/▼ to select cleaning frequency 0 to 7	4: 4 hours

3.8.2 Color C4000 & Nitrite N2000

Menu	Description	Default
0: No cleaning		
1: 4 hours		
2: 12 hours		
3: 24 hours		
4: 3 days		
5: 1 week		
6: 2 weeks		
7: 1 month		
Select	Press **Enter** then ▲/▼ to select cleaning frequency 0 to 7	3 days

3.9 Rotation

Menu	Description	Default
On: 1 Off: 0		
Average	Press **Enter** then ▲/▼ to turn on/off the rotating arm	1: On

3.10 Ref position*

Menu	Description
Steps	Press **Enter** then ▲/▼ to change motor alignment, increasing the # adjusts the position clockwise

* Factory settings **–** unit-specific value set at factory. Value can be located on the label on the inside of the cabinet door.

3.11 RS-232 data log

3.11.1 Setup

Menu	Description
Baud rate: 9600	Fixed parameters for RS-232 logging
Parity: none	Fixed parameters for RS-232 logging
Stop bits: 1	Fixed parameters for RS-232 logging
Flow ctrl: none	Fixed parameters for RS-232 logging

3.11.2 Data for log Color C2000, C4000 & Nitrite N2000

Menu	Description	Default
Add: 1 Remove: 0		
Sensors	Press **Enter** then ▲/▼ to select all lamp and water sensor data	0
Temp/Humid	Press **Enter** then ▲/▼ to select cabinet temp and humidity data	0
%T	Press **Enter** then ▲/▼ to select %T data	1
Abs	Press **Enter** then ▲/▼ to select Abs data	0
Parameter	Press **Enter** then ▲/▼ to select C2000 & C4000: Color N2000: Nitrite	0
Status	Press **Enter** then ▲/▼ to select status code for alarms & diagnostics	0

3.11.3 Data for log UV254 M2000

Menu	Description	Default
Add: 1 Remove: 0		
Sensors	Press **Enter** then ▲/▼ to select all lamp and water sensor data	0
Temp/Humid	Press **Enter** then ▲/▼ to select cabinet temp and humidity data	0
UVT	Press **Enter** then ▲/▼ to select UVT data	1
UVA	Press **Enter** then ▲/▼ to select UVA data	0
Crltn.	Press **Enter** then ▲/▼ to select correlation data	0
Status	Press **Enter** then ▲/▼ to select status code for alarms & diagnostics	0

3.11.4 Data log frequency

Menu	Description	Default
0: No data log		
1: 10 seconds		
2: 1 minute		
3: 10 minutes		
4: 1 hour		
Status	Press **Enter** then ▲/▼ 1 - 4 to select logging frequency	1: 10 seconds

...3 Menu structure

3.12 Alarms

Menu	Description
Humidity	Alarm status (0 = no alarm 1 = alarm)
Temperature	Alarm status (0 = no alarm 1 = alarm)
Leak detection	Alarm status (0 = no alarm 1 = alarm)
%T warning	Alarm status (0 = no alarm 1 = alarm)
%T alarm	Alarm status (0 = no alarm 1 = alarm)
Abs warning	Alarm status (0 = no alarm 1 = alarm)
Abs alarm	Alarm status (0 = no alarm 1 = alarm)
Parameter warning	Alarm status (0 = no alarm 1 = alarm) Color (C2000 & C4000) Nitrite (N2000)
Parameter alarm	Alarm status (0 = no alarm 1 = alarm) Color (C2000 & C4000) Nitrite (N2000)
Lamp failure	Alarm status (0 = no alarm 1 = alarm)
Lamp low	Alarm status (0 = no alarm 1 = alarm)
Lamp high	Alarm status (0 = no alarm 1 = alarm)
Cleaning	Alarm status (0 = no alarm 1 = alarm)
Clean fld Empty	Alarm status (0 = no alarm 1 = alarm)
Clean fluid low	Alarm status (0 = no alarm 1 = alarm)
System fault	Alarm status (0 = no alarm 1 = alarm)

3.13 Set alarms

Menu	Description	Default
See "Dry contact setup" on page 7		
0: Disabled		
1: Alarm		
Humidity	Press **Enter** then ▲/▼ to select high cabinet humidity alarm	1
Temperature	Press **Enter** then ▲/▼ to select high cabinet temperature alarm	1
Leak detection	Press **Enter** then ▲/▼ to select leak inside cabinet alarm	1
%T warning	Press **Enter** then ▲/▼ to select low %T warning point as alarm	0
%T alarm	Press **Enter** then ▲/▼ to select low %T alarm point as alarm	0
Abs warning	Press **Enter** then ▲/▼ to select high Abs warning point as alarm	0
Abs alarm	Press **Enter** then ▲/▼ to select high Abs alarm point as alarm	0
Parameter warning	Press **Enter** then ▲/▼ to select high warning point as alarm Color (C2000 & C4000) Nitrite (N2000)	0
Parameter alarm	Press **Enter** then ▲/▼ to select high alarm point as alarm Color (C2000 & C4000) Nitrite (N2000)	0
Lamp failure	Press **Enter** then ▲/▼ to select lamp failure alarm	1
Lamp low	Press **Enter** then ▲/▼ to select low lamp output alarm	1
Lamp high	Press **Enter** then ▲/▼ to select high lamp output alarm	1
Cleaning	Press **Enter** then ▲/▼ to select when cleaning cycle active	0
Clean fld empty	Press **Enter** then ▲/▼ to select when cleaning solution empty alarm	0
Clean fluid low	Press **Enter** then ▲/▼ to select when cleaning solution low alarm	0
System fault	Press **Enter** then ▲/▼ to select internal system error alarm	1

3.14 Mute

Menu	Description	Default
Alarms	Press **Enter** then ▲/▼ (0 or 1) to select audible alarms	0

3.15 Dual Feed

Only used with Dual Feed units

Menu	Description	Default
Enable	Press **Enter** then ▲/▼ to select 0 to disable or 1 to enable	0
Idle time	Press **Enter** then ▲/▼ to select number of minutes to wait while switching between sample lines	2
Cycle time	Press **Enter** then ▲/▼ to select minutes for total dual feed cycle time (15 - 60 minutes)	30

3.16 Dark current*

3.16.1 Color C2000 & C4000

Menu	Description
Set water value	Press **Enter** then ▲/▼ to adjust the dark current
Set lamp value	Press **Enter** then ▲/▼ to adjust the dark current

3.16.2 Nitrite N2000

Menu	Description
Set value	Press **Enter** then ▲/▼ to adjust the dark current

3.17 Set potentiometers**

3.17.1 Color C2000 & Nitrite N2000

Menu	Description
Set water	Press **Enter** then ▲/▼ to adjust the water potentiometer
Set lamp	Press **Enter** then ▲/▼ to adjust the lamp potentiometer

3.17.2 Color C4000

Menu	Description
Water1 Pot	Press **Enter** then ▲/▼ to adjust the water potentiometer
Lamp1 Pot	Press **Enter** then ▲/▼ to adjust the lamp potentiometer

3.18 Color correlation (Color C2000 & C4000)

Menu	Description	Default
Slope 1	Press **Enter** then ▲/▼ to adjust the linear correlation factor for the Color measurement – single feed	100
Slope 2	Press **Enter** then ▲/▼ to adjust the linear correlation factor for the Color measurement – dual feed	100

3.19 Correlation calculation (Nitrite N2000)

Menu	Description	Default
Slope 1	Press **Enter** then ▲/▼ to to adjust the linear correlation factor for the correlated measurement – single feed	100
Slope 2	Press **Enter** then ▲/▼ to to adjust the linear correlation factor for the correlated measurement – dual feed	100

* Factory settings **–** unit-specific value set at factory. Value can be located on the label on the inside of the cabinet door.

** Factory settings **–** unit-specific value set at factory. Value can be located on the label on the inside of the cabinet door.

...3 Menu structure

3.20 Compensation

3.20.1 Color C2000

Menu item	Description
Enable	Press **Enter** then ▲/▼ to select 0 to disable or 1 to enable
Weighting	Weighting for turbidity compensation
Set Water2 DC	Factory setting*
Set Lamp2 DC	Factory setting*
Water2 pot	Factory setting*
Lamp2 pot	Factory setting*

3.20.2 Color C4000

Menu item	Description	Default
Enable	Press **Enter** then ▲/▼ to select 0 to disable or 1 to enable	
Weighting	Factory setting	100
Set Water2 DC	Factory setting. Press **Enter** then ▲/▼ to adjust the dark current for Water2	
Set Lamp2 DC	Factory setting. Press **Enter** then ▲/▼ to adjust the dark current for Lamp2	
Water2 pot	Press **Enter** then ▲/▼ to select 0 to adjust the Water2 potentiometer	
Lamp2 pot	Press **Enter** then ▲/▼ to select 0 to adjust the Lamp2 potentiometer	

3.21 Turbidity comp.

Menu item	Description	Default
Enable	Press **Enter** then ▲/▼ to select 0 to disable or 1 to enable	
Weighting	Weighting for turbidity compensation	100
Dark current	Factory setting**	
Pot value	245	

* Factory setting **–** unit-specific value set at factory. Value can be located on the label on the inside of the cabinet door.

** Factory setting **–** unit-specific value set at factory. Value can be located on the label on the inside of the cabinet door.

4 4-20 mA setup

The analyzer is equipped with a 4-20 mA output capability. The 4-20 mA can be set to produce a user selectable mg/L value for the low (4 mA) and a separate value for high (20 mA). Figure 2 is an example of a 4-20 mA setup for a customer who wanted to log Nitrite values between 25 and 55 mg/L.

Refer to "4-20 mA setup" on page 13.



Figure 2 4-20 mA set up

5 RS-232 data logging

The analyzer has the capability to data log various performance variables on a local computer via an RS-232 interface. The data log frequency as well as the specific data to be logged is configurable. Refer to "RS-232 data log" on page 9.

The RS-232 data feed is through a 9-pin serial cable to a com port on a local computer supplied by the owner. Only two wires are used, as shown in Figure 3. If the computer does not have a 9-pin serial port, you can use a USB-to-serial adapter.

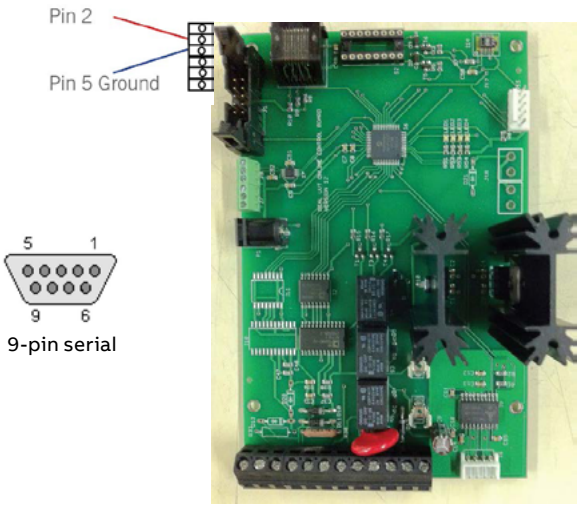


Figure 3 Main board

Note:
The communication protocol for RS-232 is ASCII. An example of one data stack is shown here based on the use of optional turbidity compensation:

```
91.2,27650,25300,28000,26000,31.0,43.3,150
```

The order of the data stack in ASCII (from left to right) is:
%T (or Abs) | Lamp | Water | VIS Lamp | VIS Water | Temperature | Humidity | Status.

…5 RS-232 data logging

The output value can be %T, Abs, or Nitrite mode, which is selected via the Abs/%T Mode in the Analyzer menu in Section 9. Table 2 itemizes each parameter and its corresponding value. Without turbidity compensation, no VIS Lamp or Water values would be listed.

Table 2 Data logging – ASCII string description for analyzer

Parameter	Value
%T/UVT	91.2
Lamp	27650
Water	25300
Vis lamp (optional)	28000
Vis water (optional)	26000
Temperature	31.0
Humidity	43.3
Status	150

If your system has a Dual Feed accessory (and optional turbidity compensation is still in effect), the ASCII string would be slightly different. %T is replaced by %T 1 and 2, which correspond to Stream 1 and 2, and % Removal. An example of one row of characters is shown below:



The order of the data stack in ASCII (from left to right) is: %T1 | %T2 | % Removal | Lamp | Water | VIS Lamp | VIS Water | Temperature | Humidity | Status. %T1 and 2 can be replaced with Abs 1 and 2 or Color 1 and 2.

Table 3 itemizes each parameter and its corresponding value. Without optional turbidity compensation, no VIS Lamp or Water values would be listed.

Table 3 Data logging – ASCII string description for analyzer with Dual Feed

Parameter	Value
%T 1/UVT 1 (stream 1)	91.2
%T 2/UVT 2 (stream 2)	95.0
% removal	3.8
Lamp	27650
Water	25300
Vis lamp (optional)	28000
Vis water (optional)	26000
Temperature	31.0
Humidity	43.3
Status	150

6 Humidity control

The analyzer includes a dehumidifier to control the humidity inside the analyzer. Standing upright in a holder at the bottom left corner of the analyzer as pictured in Figure 4, the dehumidifier maintains low relative humidity (RH) to prevent condensation from forming on the quartz flow cell walls.



Figure 4 Dehumidifier

The color of the beads visible through the plastic window on the front of the dehumidifier indicate the degree of moisture saturation (See Figure 5).

Table 4 Dehumidifier bead indications

Bead color	Condition
Yellow	Dry
Green	Wet

The unit lasts 20 to 30 days before recharge is needed.



Figure 5 Dehumidifier beads

6.1 Recharge the dehumidifier

1. Remove the dehumidifier from the cabinet.
2. Plug the dehumidifier into a 110 to 240 V AC wall outlet.
3. Leave the dehumidifier for 10 to 12 hours to regenerate.

The color of the dehumidifier beads will change from green to yellow when the dehumidifier is fully regenerated.

The dehumidifier can take several minutes and possibly up to an hour to fully dry the air in the analyzer.

Each time the door to the cabinet is opened, the drying process starts again. It is recommended to keep the cabinet door closed as much as possible in a high ambient humidity environment.

The humidity alarm is triggered if the humidity level is 25 %RH or above.

Note:
This level of humidity is not necessarily harmful to the analyzer. The main problem posed by humidity is the increased potential for condensation forming on the flow cell especially if the sample water is very cold, as this can severely affect the accuracy of the analyzer.

To check the progress of the drying process, use the **Humidity** entry under **Secondary Data** in the main menu to check the current relative humidity inside the analyzer.

At sites where humidity is known to not be excessively high, and where water temperature is known to be room temperature or above, it may not be necessary to use the dehumidifier as condensation cannot form on the flow cell under these conditions.

7 Maintenance

7.1 Maintenance schedule

Table 5 Maintenance tasks and frequency

Frequency	Task
Weekly	Visual inspection (display faults, etc.)
Monthly	Validate analyzer reading with a grab sample. Recalibrate if necessary
12 to 18 months	Replace ribbon cable Replace UV lamp if applicable

7.2 Cleaning frequency and fluid

Two of the most important factors that affect the analyzer performance are the cleaning fluid used to clean the flow cell, and how often the flow cell is cleaned (cleaning frequency). The optimum cleaning fluid and cleaning frequency is dependent on the type of sample water being analyzed.

7.2.1 Cleaning frequency

The optimum frequency of cleaning is quite variable depending on the amount and type of fouling agents in the water. This will be dependent on the application and installation point.

For wastewater, a starting frequency of 4 to 24 h can be used. Once in operation, observe the flow cell for signs of fouling prior to the first cleaning cycle. If fouling is present, increase the cleaning frequency accordingly. The measured data can also be observed for signs of a “sawtooth” effect in Abs mode as shown in Figure 6. If the sawtooth effect in Abs mode shows a upward trend as displayed in Figure 7, the sensor is drifting, and cleaning frequency must be increased.

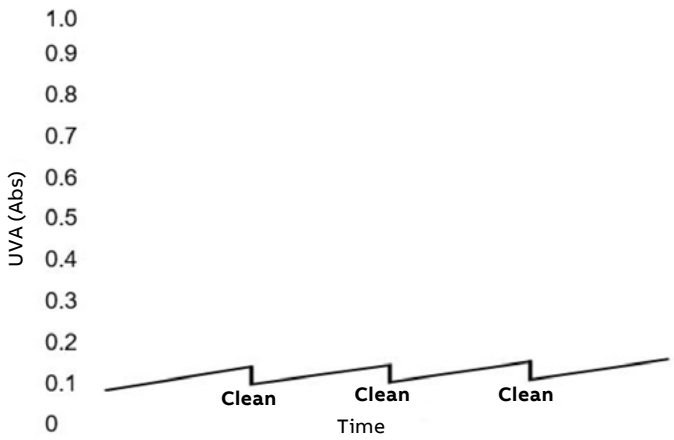


Figure 6 Abs mode – effective cleaning

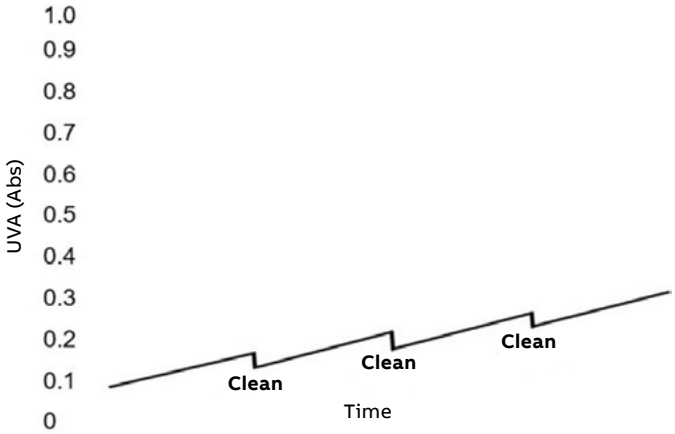


Figure 7 Abs mode – inadequate cleaning

7.2.2 Cleaning fluid

Selecting an effective cleaning solution is essential for optimal performance. The following commercial cleaning solutions and acids are readily available to remove common fouling agents.

Table 6 Commercial cleaning solutions

Solution	Fouling agents
Lactic acid <20 % solution (CLR®)	Removes lime, calcium, rust, magnesium, and other dissolved minerals
Sulfamic Acid <10 % solution (Lime-A-Way®)	Removes lime, calcium, rust, magnesium, and other dissolved minerals
Phosphoric Acid <30 % solution (Rust-Off, Hagesan Blue)	Removes lime, calcium, rust and color staining
Citric acid <20 % solution	Removes mineral scaling
Sodium hypochlorite <6 % solution	Removes oil, grease and biofilm
Acetic acid <20 % solution	Removes oil and grease
Sulfuric acid <10 % solution	Removes oil and grease

7.3 Clean the quartz flow cell

Applicability

This procedure is applicable to the analyzers in Table 7.

Table 7 Procedure applicability

Parameter	Model
Color	C2000
Nitrite	N2000
UV254	M2000 M3000

Clean the quartz flow cell in acid or cleaning solutions to remove residue on the inside surface.

The optimal cleaning method for the analyzer is an automatic scheduled clean with the UviTec Clean System I. Without the automatic cleaning system, the cleaning process is similar to the calibration model for the analyzer.

Cleaning the quartz flow cell using either the in-situ method or the manual method. The in-situ method is recommended, because it is faster, easier and just as effective.

7.3.1 Clean the quartz flow cell in-situ

1. Shut off the water supply to the analyzer if not already done.
2. Disconnect the ¼ in supply tubing at inlet connection on the analyzer.
3. Fill the supplied wash bottle with cleaning fluid and connect the ¼ in bottle tubing to the inlet connection on the analyzer.
4. Hold a finger over the small vent hole in the wash bottle cap, as shown in Figure 8.



Figure 8 Setting up the flow

5. Squeeze the bottle to get the cleaning fluid to flow through the analyzer.
6. When the fluid starts to flow, remove your finger from the vent hole and put the bottle on the analyzer, as shown in Figure 9. The fluid should continue to flow through the analyzer. If it stops, go back to step 4.



Figure 9 Bottle on cabinet

7. Let all the fluid run through the quartz flow cell until the bottle is empty, then disconnect the hose and bottle from the fitting.
8. Let the fluid remain in the quartz flow cell for 5 to 10 minutes until the quartz flow cell is clean.
9. Connect the supply line to the unit and open the valve to start the flow running.
10. If absorbance values do not come back in line with the known value, it is recommended to re-zero the analyzer.

…7 Maintenance

…7.3 Clean the quartz flow cell

7.3.2 Clean the quartz flow cell manually

1 Shut off the power to the analyzer and close the water supply.

2 Put a container below the port connections to collect water that comes out of the analyzer.

3 Disconnect the ¼ in tube at inlet and outlet connections on the analyzer to drain as much of the water as possible.

4 Open the door of the analyzer and put a paper towel or cloth below the flow cell. Some water might still be in the cell.

5 Slowly lift the blue lever of the quartz flow cell clamp. See Figure 10.

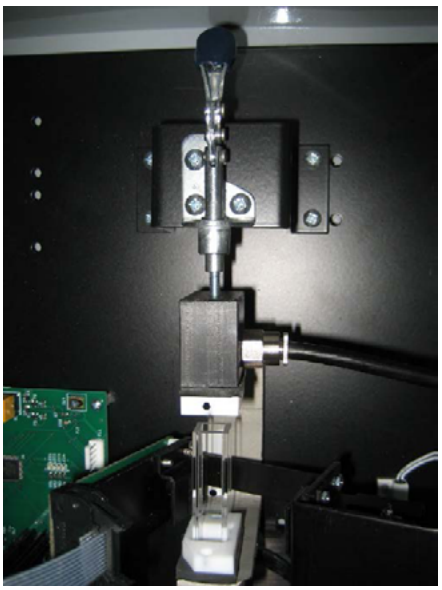


Figure 10 Release the flow cell clamp

6 Hold the flow cell with two fingers at the top, and carefully remove the flow cell from the holder.

7 Clean the flow cell.

8 Put the flow cell back in the holder. Make sure that there are no fingerprints on both sides of the flow cell where the light path goes through.

9 Lower the blue lever of the flow cell clamp very slowly to lock the flow cell in place. Make sure that the flow cell is correctly aligned when you lower the clamp.

10 Close the door of the analyzer and reconnect the tube.

11 Open the valve to start the test water flowing.

7.4 Replace the ribbon cable

The ribbon cable that connects the main circuit board to the sensor board located on the rotating assembly is a Teflon™, high-flex, 10-conductor cable. It is designed to withstand long-term exposure to the light in the cabinet.

Replace the ribbon cable every 12 to 18 months as pre-emptive maintenance.

To replace the ribbon cable (no tools necessary):

1 Unclip the end connectors that secure the old ribbon cable to the control board and rotating arm by opening the wing clips.

2 Pull out the connector and reconnect the end connectors of the ribbon cable.

3 Close the wing clips to secure the new cable.

Note:
A spare cable is included with every new analyzer and is attached to the inside of the cabinet door. To order more cables, contact ABB.

8 Dual Feed data

During dual feed mode, the measured value of each feed, along with the percent efficiency of the process is output to the RS-232 port, while just the measured value of each feed is output to the two 4-20 mA transmitters. Percent efficiency can be calculated in a PLC if desired. Percent efficiency is best calculated using measured values using the following simple equation (in this case using PCU as the unit for color measurement):

$$efficiency = (PCU\ raw - PCU\ treated) / PCU\ raw \times 100\ \%$$

During dual feed mode, the front panel display provides the color of Stream 1 on line 1 and Stream 2 on line 2.
The current feed being tested is indicated by an asterisk next to the appropriate color value.

Refer to OI/UVITEC/DUALFEED for more information on setting up the Dual Feed unit.

9 Troubleshooting

An operator has three sources of information for system diagnostics:

- LEDs on the main circuit board.
- System alarms displayed on the operator interface panel.
- Raw sensor data displayed via the **Secondary Data** menu on the operator interface panel.

9.1 Main circuit board LEDs

WARNING

Optical radiation

The measurement LEDs might be on when you open the door. Wear eye protection, or restart with the door open to prevent injury to your eyes.

If the system ever freezes, open the door and check the state of the LEDs on the Main Control Board.

Normally, the pattern of lighting from the LEDs change in specific sequence to indicate different states of operation. If the LEDs are not changing after one minute, make a note of which ones are on or off, and compare that pattern to the table below. In the table, a zero means an LED is OFF, while 1 means an LED is ON.

Note:
Each analyzer built at the ABB factory is calibrated individually to the components and the finished construction of the unit. Information for the calibration of a unit is stored on the main circuit board. Therefore, swapping boards means the calibration for a given unit will no longer be correct as it based on the precise relationships between the components. When communications issues arise that could be an indication of circuit board failure or damage, contact an ABB technician for assistance.

Table 8 LED indicators

LED 4	LED 3	LED 2	LED 1	Problem	Solution
0	0	0	0	No power	Check power connections Check fuse on main circuit board. If blown, replace with 20 × 5 mm
1	1	0	0	Bad reference position check	Check reference micro-switch on motor bracket. If damaged it may need to be replaced. Check set screw attaching rotating mechanism to motor shaft is tightened on the flat of the motor shaft If motor does not move shortly after startup, check motor connection to main circuit board. Possible bad motor or motor controller on main circuit board
1	0	1	0	Communication error to sensor board	Check connections from main circuit board to sensor board. Check for breaks in the ribbon cable. May need to replace the sensor board
1	0	0	1	Communication error to display board	Check serial and power connections to display board. May need to replace display board

10 Alarms and warnings

10.1 Humidity

Diagnostic message

Humidity

Cause
Humidity inside the analyzer is approaching a level that could cause condensation on the flow cell if water temperature is low enough

Recovery actions
The humidity alarm is tripped when the humidity level inside the analyzer is greater than 25 % RH. If the water temperature is cold, then condensation could occur on the flow cell windows at this level of humidity. The dehumidifier included with the analyzer can be used to reduce the humidity to a level that will prevent condensation no matter what the water temperature. If the sample water is warm, condensation on the flow cell may not be likely. In this case it may be possible to ignore or turn off the humidity alarm.

10.2 Lamp off

Diagnostic message

Lamp off

Cause
Lamp output is too low to provide accurate measurements.

Recovery actions
The LED settings need to be adjusted. Contact ABB for support.

10.3 Lamp high

Diagnostic message

Lamp high

Cause
Lamp output is too low to provide accurate measurements.

Recovery actions
The LED settings need to be adjusted. Contact ABB for support.

10.4 Lamp low

Diagnostic message

Lamp low

Cause
The lamp output is low but not too low for the analyzer to provide accurate measurements.

Recovery actions
The LED settings need to be adjusted. Contact ABB for support.

10.5 Leak detection

Diagnostic message

Leak detection

Cause
A leak has been detected inside the analyzer.

Recovery actions

1. Immediately shut off water flow to the analyzer.
2. Shut off the water flow.
3. Shut off the power to the analyzer.
4. Assess the damage inside the analyzer and call ABB for further instructions.
5. If the UviTec Clean system is connected to the analyzer it will have been signaled to shut of the water flow assuming no electrical short has occurred. Note that the UviTec Clean system requires power and signals from the analyzer to shut off the water flow.

10.6 Sensor comm

Diagnostic message

Sensor comm

Cause
There is a communication error between the sensor and the main board.

Recovery actions

1. Check the ribbon cable for damage.
2. Replace the cable if damage has occurred.

10.7 Temperature

Diagnostic message

Temperature

Cause
Internal temperature of the analyzer is approaching maximum recommended operating temperature.

Recovery actions
It may be necessary to relocate the analyzer to a cooler location or if it is outside it could require shading from the sun.

...10 Alarms and warnings

10.8 UVT warning

Diagnostic message

UVT warning

Cause
UVT value is approaching the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.9 UVT alarm

Diagnostic message

UVT alarm

Cause
UVT value is below the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.10 UVA warning

Diagnostic message

UVA warning

Cause
UVA value is approaching the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.11 UVA alarm

Diagnostic message

UVA alarm

Cause
UVA value is above the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.12 %T warning

Diagnostic message

%T warning

Cause
%T value is approaching the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.13 %T alarm

Diagnostic message

%T alarm

Cause
%T value is below the operator setpoint.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.14 Abs warning

Diagnostic message

Abs warning

Cause
Lamp output is too low to provide accurate measurements.

Recovery actions
The LED settings need to be adjusted. Contact ABB for support.

10.15 Abs alarm

Diagnostic message

Abs alarm

Cause
Abs value is approaching the operator set point.

Recovery actions
Flow cell is dirty and needs to be cleaned OR a grab sample should be obtained and compared to the sample water to confirm measurement.

10.16 Color warning

Diagnostic message

Color warning

Cause

Color value is approaching the operator set point.

Recovery actions

Does not necessarily indicate an issue with the system. If this warning appears frequently, the flow cell might be dirty and requires cleaning, or recalibration of the color correlation may be needed.

10.17 Color alarm

Diagnostic message

Color alarm

Cause

Color value is above the operator set point.

Recovery actions

Does not necessarily indicate an issue with the system. If this alarm appears frequently, flow cell may be dirty and requires cleaning, or recalibration of the color correlation may be needed.

11 Secondary data

The **Secondary Data** menu gives raw data on six variables: Lamp 1/2, Water 1/2, Temperature, and Humidity. There are two Lamp values, and two Water values – one set for each measurement LED.

Rotation position 1 means the lamp is oriented to the reference position i.e., lamp is aligned with a sensor to read the lamp value. Rotation position 2 means the lamp has rotated 90° so that light is directed through sample water within the flow cell to the sensor.

If all four numbers display 0, this indicates the system did not start up correctly (refer to Table 8). If Lamp and Water numbers are 0 but humidity and temperature data appears to be correct then this indicates a communication problem with the sensor board located on the rotating assembly.

11.17.1 Color

Table 9 Secondary Data for Color

Model	Menu item	Rotation position	Water path length (mm)	Ideal value
C2000	Lamp 1/2	1	—	2,500 to 3,300
C4000			—	20,000 to 35,000
C2000	Water 1/2	2	—	50 to 3,300
C4000			100	50 to 35,000
C2000 C4000	Temperature	—	—	Above 0 and less than 50 °C (122 °F)
C2000 C4000	Humidity	—	—	Less than 25 % RH

11.17.2 Nitrite

Table 10 Secondary Data for Nitrite

Model	Menu item	Ideal value
N22000	Lamp	15,000 to 35,000
N22000	Water	350 to 35,000
N22000	Temperature	Above 0 and less than 50 °C (122 °F)
N22000	Humidity	Less than 25 % RH

11.17.3 UV254

Table 11 Secondary Data for UV254 (M2000, M4050, M4100, M4250)

Model	Menu item	Rotation position	Water path length (mm)	Ideal value
All	Lamp	1	—	20,000 to 35,000
M2000 M4250	Water	2	2 mm	50 to 35,000
M4050			50 mm	
M4100			100 mm	
All	Temperature	—	—	Above 0 and less than 50 °C (122 °F)
All	Humidity	—	—	Less than 25 % RH

Table 12 Secondary Data for UV254 M3000

Model	Menu item	Rotation position	Water path length (mm)	Ideal value
M3000	Lamp 1	1	—	1,500 to 3,500
M3000	Water 1	1	2 cm	50 to 3,500
M3000	Lamp 2	2	—	1,500 to 3,500
M3000	Water 2	2	1 cm	50 to 3,500
M3000	Temperature	—	—	Above 0 and less than 50 °C (122 °F)
M3000	Humidity	—	—	Less than 25 % RH

11.1 Lamp numbers

Lamp numbers are not affected by sample water absorbance as they are a direct reading of the LED output.

11.1.1Color

Table 13 Lamp numbers for Color (C2000, C4000)

Condition	Value	Issue/action
Values fluctuate more than 200 points after monitor has warmed up	Fluctuating	Problem with LEDs or sensor. Contact ABB for support.
High lamp numbers	3,500 and higher	The LED settings may need to be adjusted. Contact ABB for support.
Lamp Low alarm appears	1,000 to 1,500	The LED settings may need to be adjusted. Contact ABB for support.
Lamp Off/failure	Significantly lower than 1,000	The LED settings may need to be adjusted. Contact ABB for support.

11.1.2 UV254

Table 14 Lamp numbers for UV254 (M2000, M4050, M4250)

Condition	Value	Issue/action
Values fluctuate more than 200 points after monitor has warmed up	Fluctuating	Problem with LEDs or sensor Contact ABB for support.
Current lamp may be brighter than previous lamp	40,000 and higher	Change lamp or wait for a 14-day burn-in period to see if the lamp value falls below 40,000
Lamp Low alarm appears	15,000 to 10,000	Replace the lamp
New lamp	Significantly lower than 15,000	The lamp may be faulty, possibly damaged during shipping

Table 15 Lamp numbers for UV254 (M3000)

Condition	Value	Issue/action
Values fluctuate more than 20 points after monitor has warmed up	Fluctuating	Problem with LEDs or sensor Contact ABB for support.
Current lamp may be brighter than previous lamp	4,000 and higher	Change lamp or wait for a 14-day burn-in period to see if the lamp value falls below 4,000
Lamp Low alarm appears	1,000 to 1,500	Replace the lamp
New lamp	Significantly lower than 1,500	The lamp may be faulty, possibly damaged during shipping

11.2 Water numbers

Water numbers are dependent on the absorbance of the sample water stream.

Table 16 Water numbers

Condition	Value	Issue/action
Water values in low range	Less than 1,000	Sample is close to the bottom of the measurement range OR flow cell needs to be cleaned

11.3 Temperature and humidity

The internal temperature should be kept below 50 °C (122 °F). The system will alarm if this temperature is reached. If this happens, it may indicate the analyzer should be moved to a shaded or cooler location.

Humidity should be kept as low as possible especially when the sample water is cold as condensation can form on the flow cell which can severely affect accuracy. Refer to "Humidity control" on page 15.

12 Parts and accessories

12.1 Parts

Table 17 Parts list

Name	Description	Part number
UV lamp	UviTec replacement UV lamp	3KXA300000U0079
Quartz windows	Quartz windows and seals for UV254 M4000 series	3KXA300000U0075
Dehumidifier	UviTec dehumidifier, regenerable dessicant pack	3KXA300000U0076
Cleaning bottle	UviTec cleaning bottle, 1 L (Clear)	3KXA300000U0044
Calibration bottle	UviTec calibration bottle 1 L	3KXA300000U0046
Standard power supply	UviTec replacement power supply – 24 VDC 1.6 – non-NEMA	3KXA300000U0177
NEMA 4/IP65 power supply	UviTec external power supply, 2.5 A NEMA 4/ IP65	3KXA300000U0082
Ribbon cable	UviTec ribbon cable – 2000 or 3000 series	3KXA300000U0077
	UviTec ribbon cable – 4000 series	3KXA300000U0078
Flow cell 1 mm	UviTec replacement flow cell for 2000 series, quartz, 1 mm	3KXA300000U0060
Flow cell 2 mm	UviTec replacement flow cell for 2000 series, quartz, 2 mm	3KXA300000U0061
Flow cell 4 mm	UviTec replacement flow cell for 2000 series, quartz, 4 mm	3KXA300000U0062
Flow cell 8 mm	UviTec replacement flow cell for 2000 series, quartz, 8 mm	3KXA300000U0063

Trademarks

- Teflon is a trademark of The Chemours Company FC, LLC
- UviTec is a trademark of ABB Limited.

Notes

ABB Measurement & Analytics

For your local ABB contact, visit:
abb.com/contacts

For more product information, visit:
abb.com/measurement

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