UviTec™ Field Meter

UV254



UviTec Field Meter
UV254

Introduction

The UviTec UV254 field meter's innovative Split-Sense technology is designed to take sensor readings before and after insertion of the quartz cuvette containing the water sample.

The two sensor measurements allow for automatic compensation of minor lamp fluctuations that can occur between the time the test is taken and the time the field meter was calibrated. Therefore, the need to frequently recalibrate the field meter between uses is eliminated.

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 UV254 field meter – Data sheet	DS/AUV104

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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. **'Note'** does not indicate a dangerous or harmful situation.

1.2 Product warnings

⚠ WARNING

Toxic material

This product can expose you to chemicals including mercury which is known in the State of California to cause birth defects or other reproductive harm.

⚠ WARNING

Optical radiation

The UviTec field meters contain a UV light, which emits light at the UV 254 nm wavelength. Do not look directly at the UV light, as it could cause permanent eye damage and burn unprotected skin.

⚠ WARNING

Electricity hazard

Do not disassemble the field meter without unplugging the power supply first. Turn off the field meter before you do servicing on it.

⚠ CAUTION

Improper use of this device may cause injury.

⚠ CAUTION

Keep the field meter out of reach of children.

⚠ CAUTION

Do not leave the field meter unattended.

Visually examine the field meter before operation. If the quartz cuvette or UV light are broken or damaged, do not use the field meter.

Make sure that all responsible personnel carefully read this manual before operating or servicing the field meter.

Failure to properly operate and maintain this device may impact the effectiveness of the field meter and warranty.

1.3 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.

1.4 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 System overview

The UviTec field meter is powered in two ways:

- From a wall or car power adapter (see Figure 1). Wall adapter plugs come in various shapes and sizes to accommodate your region's electrical outlets.



Figure 1 Field meter with power adapter

- From a battery pack or charger power supply (see Figure 2). The battery's charge lasts for 2 to 3 hours to enable remote testing. When the battery is switched off, the adapter supplies power directly to the field meter.



Figure 2 Field meter with a battery pack

3 Unpack the field meter

Remove the field meter from the packaging and carefully examine it to make sure that no damage occurred during shipping.

The field meter includes the items in Table 1:

Table 1 Items and quantity list for unpacking

Item	Applicability	Quantity
UV254 field meter	All	1
1 mm cuvette	P.050	1
2 mm cuvette	P.100, P.110	1
10 mm cuvette	P.200, P.110	1
40 mm cuvette	P.300	1
Wall adapter	Field meters without battery pack	1
Car adapter	Field meters without battery pack	1
Battery pack with battery charger	Field meters with battery pack	1

4 Operation guide

4.1 Operator guidelines

Please read the guidelines that follow before you use the UviTec field meter:

- The field meter must be calibrated before you use it for the first time.
- Always handle cuvette by the frosted sides.
- Make sure that the black dot on the cuvette is facing out, aligned with the circle next to the test chamber.
- Always use the same cuvette for both calibration and testing.
- Always rinse the cuvette a minimum of two times before each use and when you change the calibration or sample water.
- Make sure that the outside of the cuvette is clean and dry before you do the test (no fingerprints, dust, water streaks, etc.).
- If the display does not show Ready 90 seconds after power up, it might be necessary to replace the light.
- Turn off the field meter when not in use.
- Do not disassemble the field meter without unplugging the power supply.
- If a battery pack is installed, move the battery switch to the **Off** position when the field meter is not in use.

4.2 Operator interface description

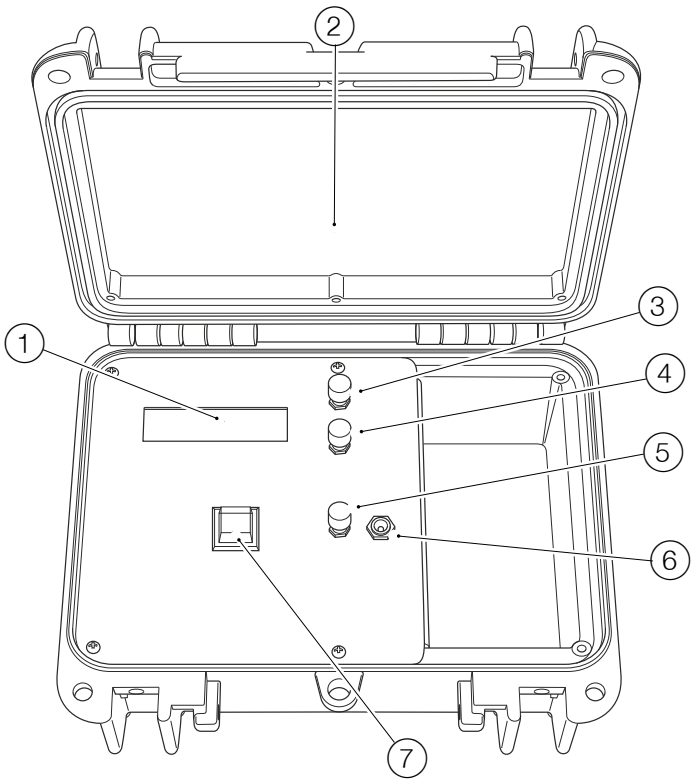


Figure 3 Operator interface

Table 2 Operator interface descriptions

Item	Description
①	2-line × 16-character backlit LCD
②	Rugged and convenient watertight carrying case
③	**Calibrate** button – press for calibration
④	**Compute** button – press to perform test
⑤	**On/Off** button –LED faceplate is lit with power on
⑥	Power jack for provided power supply
⑦	Cuvette holder for insertion of water sample using the supplied cuvette

Note:
P.100, P.200, and P.300 models:
To switch between UV Absorbance (UVA) and UV Transmittance (UVT) modes, press and hold the **Calibrate** and **Compute** buttons for 2 seconds.
P.110T (UVT only), and P.110A (UVA only) models:
Use the **Calibrate** and **Compute** buttons to switch between 2 mm and 10 mm cuvettes.
P.050 (UVA only) model:
The Calibrate and Compute function does not apply.

...4 Operation guide

4.3 Calibrate the field meter

1 If your meter has a battery pack, switch the battery pack to the **On** position.

2 Plug in the power cord and press **Power** to turn on the field meter. After 90 seconds, the display will read Ready.

3 Make sure that the quartz cuvette is not in the test chamber.

4 Press the **Calibrate** button. The display will read Insert Cuvette with DI water.

5 Ensure the outside of the cuvette is clean and dry.

6 Insert the cuvette containing DI water ensuring the black dot on the cuvette is aligned with the circle next to the test chamber.

7 Display will read 100.0 when in UVT mode or 0.000 when in UVA mode. The field meter is now calibrated.

Note:
We recommend to calibrate the field meter again after you replace the UV lamp or use a new cuvette for sampling.
For best results, calibrate the field meter every month using DI water, especially when the field meter is being used weekly.

4.3.1 Calibration memory

The UviTec UV254 field meter keeps its calibration settings in its memory. This feature eliminates the need to zero the field meter before each individual water sample being tested (even after powering the field meter off and on). Users may choose to periodically check the field meter's calibration by using a DI water sample (or another water sample equivalent to 100 % UVT/0 UVA). If the accuracy of the calibration is not within 0.5 % UVT/0.003 UVA, refer to "Calibrate the field meter" on page 6.

Note:
It is not necessary to send the field meter back to ABB for verification of calibration. When calibrating, use 100 % UVT/0 UVA water (DI water). Calibration can also be verified with an IN-SPEC® solution that has a known UVT/UVA value. Contact ABB for more information about IN-SPEC.

4.4 Test a water sample

1 If your field meter has a battery pack, switch the pack to the **On** position.

2 Plug in the power cord and press **Power** to turn on the field meter. After a 90 second warm-up time, the display will read Ready.

3 Make sure that the quartz cuvette is not in the test chamber.

4 Press the **Compute** button. The display will read Insert Cuvette with Test Water.

5 Make sure that the outside of the cuvette is clean and dry.

6 Insert the cuvette containing the water sample to be tested. Align the black dot on the cuvette with the circle next to the test chamber.

7 The display will show the computed UVT or UVA.

8 To do another test, remove the cuvette from the test chamber. Rinse the cuvette twice before inserting the new sample. Repeat steps 4 thru 6.

9 Clean and dry the cuvette thoroughly before reinserting into the field meter for storage.

10 Press **Power** to turn off the field meter.

4.5 Correlated values

An estimate of the value for a water quality parameter can be made using the UVA data, provided that a good linear relationship exists between the parameter and the UVA. This requires collecting samples with known UVA values and sending these samples to a lab for analysis using a reference method to establish the parameter concentration e.g., mg/L TOC.

To find the linear relationship, you need a spreadsheet to graph parameter values versus UVA values i.e., TOC vs. UVA in this example. Microsoft® Excel® is one of the tools you can use to graph the data. When the data plot is complete, the slope of the regression line (also called the trend line) that goes through the data points indicates the ratio between TOC and UVA. Moving forward, an estimation of TOC can be made for a sample by multiplying the UVA value of the sample by this ratio.

Over time, if you keep adding more reference lab data to your TOC vs. UVA plot, the accumulation of many data points will build a more accurate estimate of the TOC.

Note:
If processes change, the ratio you are applying might not be reflective of current conditions.

4.5.1 Create ratio to calculate water parameter

It is recommended to start with at least five data points to graph the relationship between UVA and TOC. That is, UVA values for five grab samples and their respective lab values for TOC.

You can use the form in Appendix A on page 12 to record grab sample data as it is collected. Use Excel or a similar tool to create your graph.

As you can see in the example below, the linear relationship between TOC and UVA yields a slope of 32.

Table 3 Grab sample

Grab sample	UVA	Lab value (TOC in mg/L)
1	0.05	2.50
2	0.08	3.00
3	0.10	3.30
4	0.15	4.50
5	0.20	6.00
6		
7		
8		
9		
10		
11		

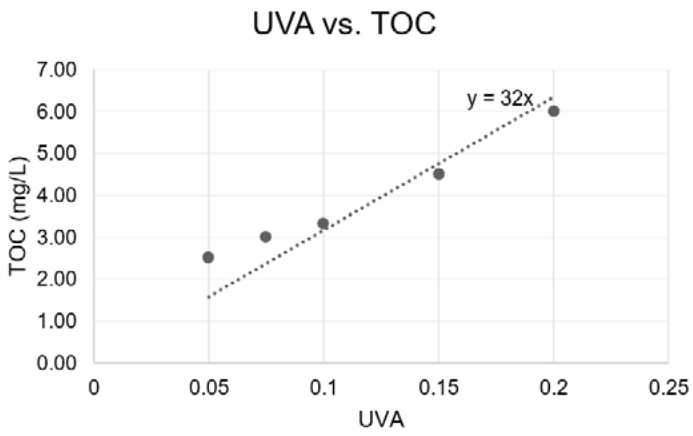


Figure 4 UVA vs. TOC graph

4.5.2 Calculate water parameter value from grab samples

Once the initial ratio is calculated, you can apply that ratio against your grab samples to calculate an estimated value for the water parameter (e.g., TOC). For example:

Table 4 Water parameter values

Grab sample	UVA	Ratio or slope	TOC (mg/L) (UVA × ratio)
6	0.06	32	1.92
7	0.07	32	2.24
8	0.09	32	2.88

Periodically, you may want to check the ratio against subsequent lab values and use an updated number to calculate the water parameter value. For example, after the lab values for 20 grab samples have been input into your spreadsheet, the graph will display a new ratio or slope.

Table 5 Lab values for 20 samples

Grab sample	UVA	Lab value (TOC in mg/L)
18	0.08	2.75
19	0.09	3.1
20	0.15	5.0

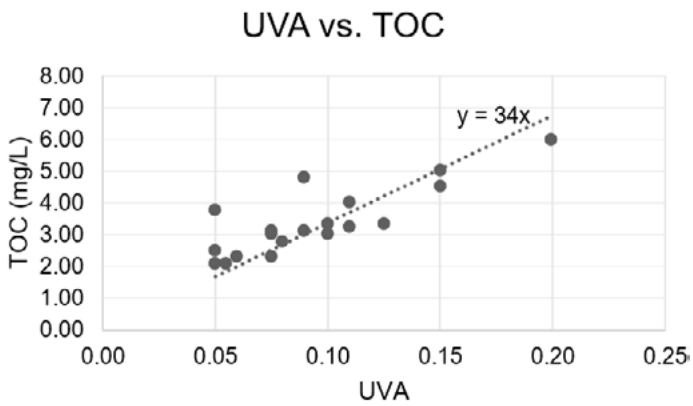


Figure 5 UVA vs. TOC with new slope

Take the updated slope (34) and calculate the parameter values as shown in Table 6. As the size of your spreadsheet increases, you may want to delete a portion of the oldest data. This may help keep your ratio relevant to present-day conditions.

Table 6 Calculate parameter values

Grab sample	UVA	Ratio or slope	TOC (mg/L) (UVA × ratio)
21	0.06	34	2.04
22	0.07	34	2.38
23	0.09	34	3.06

5 Cleaning

A clean quartz cuvette is important for the optimal performance of the UviTec UV254 field meter.

The outside of the cuvette must be clean and dry.

Clean the inside of the cuvette regularly to prevent the accumulation of mineral deposits and other fouling agents that come from the test water.

1 Use a cleaning solution and small cleaning object, such as a cotton swab, to clean the inside of the cuvette.

2 Rinse the cuvette with DI water and polish the outside with a low-lint wipe.

Table 7 Chemical 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 (Hagesan® Blue)	Removes lime, calcium, rust and color staining
Citric acid <20 % solution	Removes mineral scaling
Sodium hypochlorite <6 % solution (bleach)	Removes biofilm, oil and grease
Acetic acid <20 % solution	Removes oil and grease
Sulfuric acid <10 % solution	Removes oil and grease

6 Storage and transport

When storing or transporting the field meter, it is important to make sure that the cuvette is clean and free of water. Put the clean and dry cuvette into the test chamber with the foam protection layer on top, then securely close and fasten and the lid.

6.1 Transport field meters with a battery pack

Transport the field meter with the battery pack switch in the **Off** position.

6.2 Store field meters with a battery pack

Table 8 Storage duration and switch positions

Duration of storage (days)	Battery pack switch position
0 to 7	On
7 to 21	Off
21 and over	On with charger plugged in

7 UV light and white lamp

There are two lights in the field meter (as shown in Figure 6), a low-pressure mercury UV light, and a white light. If the field meter's display reads `Lamp Stabilizing` for an extended period of time without entering Ready mode, do a check of the UV lamp and white lamp.

7.1 Check the UV light and white light

1. With the field meter fully assembled, plug in the power cord and press **Power** to turn the field meter on.
2. Look for a white light glow in the cuvette holder area.
3. If you do not see the white light, it might be necessary to tighten or replace the white lamp.
4. If white light is visible, the UV light may need to be checked/ replaced.
5. Press **Power** to turn off the field meter.
6. Use a Phillips® screwdriver to remove the four screws on the metal faceplate.
7. Look for cracked, damaged, or loose UV light or white light.
8. If the bulbs were loose, tighten them and check if the issue has been resolved.
9. If the bulbs are cracked or damaged, contact your supplier for a replacement.



Figure 6 White and UV lights

7.2 Replace the UV light

Requirements

Table 9 Tools required

Part number	Description	Quantity
—	Phillips screwdriver	1

Table 10 Parts required

Part number	Description	Quantity
3KXA300000U0079	UV light	1

Procedure

1. Make sure that the power to the field meter is off (for field meters with a battery pack, turn the battery pack switch to **Off**).
2. Use a Phillips screwdriver to remove the four screws on the metal faceplate.
3. Use a small flat head screwdriver to pry the UV light base from the ceramic lamp socket.
4. Press the new UV lamp (3KXA300000U0079) securely into the ceramic light socket.
5. Replace the four screws on the face plate and power the field meter on to confirm the field meter will stabilize into Ready mode.
6. Calibrate the field meter.

8 Replace the fuse

In case of a power surge, or if the field meter does not power up, it might be necessary to replace the fuse inside the field meter.

Requirements

Table 11 Tools required

Part number	Description	Quantity
—	Phillips screwdriver	1

Table 12 Parts required

Part number	Description	Quantity
—	20 × 5 mm, rated to 250 V at 1 A	1

Procedure

1. Make sure that the power to the field meter is off (for field meters with a battery pack, turn the battery pack switch to **Off**).
2. Use a Phillips screwdriver to remove the four screws on the metal faceplate, and turn over the faceplate and inner assembly.
3. Remove the blown fuse (left in Figure 7) and replace it with the spare fuse (right in Figure 7).
4. Put the faceplate and inner assembly back into position and install the four screws.
5. Power on the field meter to make sure that it operates correctly.

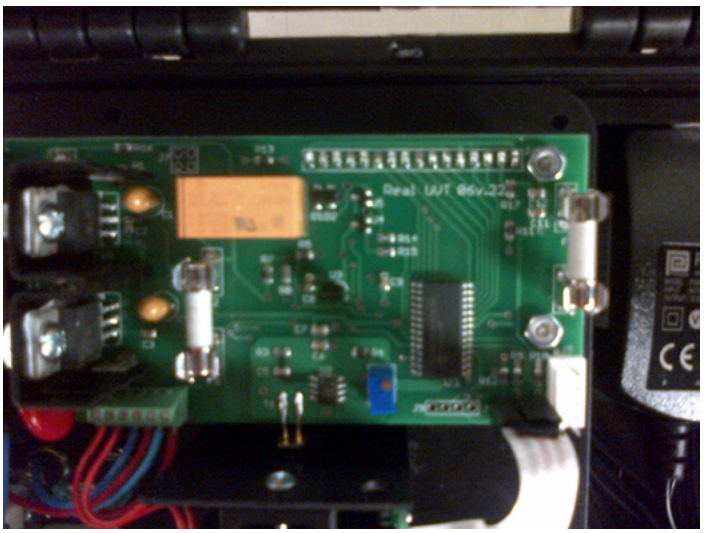


Figure 7 Location of the circuit board fuse

9 Recharge the battery pack

The battery pack supplies power for approximately two to three hours of testing. A BATTERY LOW warning on the display will show when charging is necessary. The field meter will have sufficient power for 10 to 15 minutes of operation after this warning shows.

To recharge the battery, plug in the field meter using the battery charger. Make sure that the switch on the battery pack is in the **On** position. The battery pack will require one to two hours to fully charge.

The field meter will not be damaged by being left on the charger.

The battery pack option features smart-charge circuitry that lets you use the field meter for sampling or calibration while recharging.

10 Parts and accessories

Part number	Part name	Description	Applicability
3KXA300000U0049	IN-SPEC 60 mL	IN-SPEC S60 standard UVT solution (60 mL)	All
3KXA300000U0050	IN-SPEC 250 mL	IN-SPEC S250 standard UVT solution (250 mL)	All
3KXA300000U0051	Cuvette – 1 mm	1 mm path length quartz cuvette	P.050
3KXA300000U0052	Cuvette – 2 mm	2 mm path length quartz cuvette	P.100, P.110
3KXA300000U0053	Cuvette – 10 mm	10 mm path length quartz cuvette	P.110, P.200
3KXA300000U0054	Cuvette – 40 mm	40 mm path length quartz cuvette	P.300
3KXA300000U0055	Wall adapter	UviTec wall adapter, 12 V DC	All
3KXA300000U0056	Car adapter	UviTec car adapter, 12 V DC	All
3KXA300000U0057	Battery charger	UviTec battery charger, 12 V DC	Field meters with battery pack
3KXA300000U0059	Battery pack	UviTec field meter battery	Field meters with battery pack
3KXA300000U0079	UV lamp	UV lamp for UV254 field meters	All

Appendix A Grab sample data collection

Grab sample number	UVA	Lab value	Grab sample number	UVA	Lab value

Trademarks

- CLR is a registered trademark of Jelmar, LLC.
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Notes

Notes

ABB Measurement & Analytics

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

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