



Scuba Blue Green Algae Buoy

Water quality meter for blue and green algae

User manual



Meet the difference

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On these operating instructions



If the text follows a mark (as shown on the left), this means that an important instruction follows.



If the text follows a mark (as shown on the left), this means that an important warning follows relating to danger to the user or damage to the apparatus. The user is always responsible for its own personal protection.

Text

Italic indicated text indicates that the text concerned appears in writing on the display (or must be typed).

1. Introduction

This manual describes the use and maintenance of the Scuba BGA. The Scuba BGA is suitable for monitoring harmful algal blooms and rain events in surface waters.

1.1 Warranty

The Scuba BGA is warranted for 3 years from the date of delivery subject to proper installation and application of the equipment in accordance with the provisions of this manual. Any defects or faults should be reported in writing to your supplier immediately, but no later than 30 days after discovery. Transportation costs, travel hours and travel kilometers are not covered by the warranty. Defects or faults resulting from unintended/incompetent use, modifications not authorized by Royal Eijkelkamp, inadequate maintenance, other abuse and damage due to transport are not covered by the warranty. Royal Eijkelkamp can never be held liable for direct and/or indirect consequential damage resulting from defects or faults in the equipment supplied by Royal Eijkelkamp. During the statutory warranty period, maintenance shall only be carried out by Royal Eijkelkamp or competent persons designated by it. Any claim under the warranty can only be made if the maintenance intervals mentioned in Chapter 5 have been met.

1.2 Safety instructions

To safely perform measurements with the Scuba BGA buoy in surface water that may be contaminated with algae, we recommend wearing protective clothing (including liquid-proof gloves) to prevent contact with the algae. You should also follow normal safety regulations for working on the water, such as wearing a life jacket and using a stable boat.

2. The Scuba BGA buoy

The Scuba BGA buoy is a revolutionary new monitoring and measurement system that provides early warning of harmful algal blooms and other water contaminants. With low cost per unit, Scuba BGA buoys can be quickly deployed at multiple sites, where they instantly transmit data to a web portal where analyses improve early warning capabilities.

2.1 Functional description

The Scuba BGA buoy is a floating sensor buoy that measures 5 key water parameters and transmits the data to the cloud. It is solar powered, mobile connected and has self-cleaning sensors that collect data 24/7. Readings are updated every 30 minutes and sent to the dashboard every 2 hours. The buoy weighs 3.6 kg and can be deployed within 30 minutes by non-technical personnel.

The Scuba BGA buoy measures the following parameters:

- Green algae via chlorophyll-a (RFU or $\mu\text{g/l}$)
- Blue algae (cyanobacteria) via phycocyanin (RFU or $\mu\text{g/l}$)
- Turbidity (NTU)
- Ambient light (PAR = Photosynthetically Active Radiation)
- Water temperature (Celsius or Fahrenheit)
- Air temperature, wind, rain (via local 5-day weather forecast on the Internet)
- GPS coordinates

The Scuba BGA uses the following sensor technology:

- The Scuba BGA leverages fluorescence of the pigments within algae and cyanobacteria (blue-green algae) to detect the abundance of the organisms.
- Chlorophyll-a, present in all algae and cyanobacteria, is the most frequently used indicator of algal growth. Phycocyanin, typically present in freshwater cyanobacteria, is used as the indicator for blue-green algae.
- The Scuba BGA uses an excitation wavelength of 420 nm for chlorophyll-a, and 575 nm for phycocyanin. The peak emission wavelengths measured are at 670 nm and 642 nm respectively.
- The Scuba BGA utilizes advanced analog and digital signal processing to eliminate the disturbance from ambient light that can affect other sensors' fluorescence measurements.

The algae are measured in RFU (= Relative Fluorescence Units) and are created from light sensor volts. The RFU can be transformed into $\mu\text{g/l}$ by field calibration as described in chapter 6. Field calibration involves calibrating the buoy based on sampling in the field. This can be done through:

- a. The measurement result (e.g. $\mu\text{g/l}$) of a portable fluorescence meter (e.g. AlgaeTorch from BBE Moldaenke)
- b. An analytical result (e.g. $\mu\text{g/l}$) of a water sample analyzed in a laboratory

The RFU : $\mu\text{g/l}$ ration typically ranges from 6 to 14 depending on among others like algae species, cell transparency and geometry (see also 2.2 Limitations of use).

The measurement data are sent to the web portal via 4G cellular technology. The system can automatically switch between three carriers to optimise reception, and an oversized antenna is included. The web portal presents the data and analyzes the sensor results in a simple dashboard accessible via the Internet from any device (PC, phone, tablet). The data are presented in easy-to-interpret graphs, are permanently stored and are easily downloadable. Customized alerts at thresholds and progressively evolving and predictive analytics enable more accurate algorithms for bloom identification.

2.2 Limitations of use

Determination of chlorophyll and phycocyanin in the field using fluorescence measurement techniques will never be as accurate as measurements made in a lab using either cell counting or analysis of molecular chlorophyll and phycocyanin after its extraction from cells.

Factors adversely affecting accuracy include:

- Differences in the fluorescent response:
 - between various species of phytoplankton
 - due to cell transparency and geometry
 - due to stage of algae growth
 - caused by temperature
 - by ambient light (Non Photochemical Quenching (NPQ))
- Interference caused by turbidity
- Interference from other microbiological species and compounds, which fluoresce at similar wavelengths.

Non Photochemical Quenching (NPQ) reduces fluorescence of algae in bright daylight. Handheld measurements in bright daylight can underestimate readings. Chlorophyll-a fluorescence can be decreased by up to 79% and Phycocyanin fluorescence by up to 59% at maximum irradiance compared to dark-adapted periods. Therefore it is recommended to measure with a handheld sensor early or late in the day. In the webportal a compensation algorithm is included to compensate the measured chlorophyll-a and phycocyanin for NPQ.

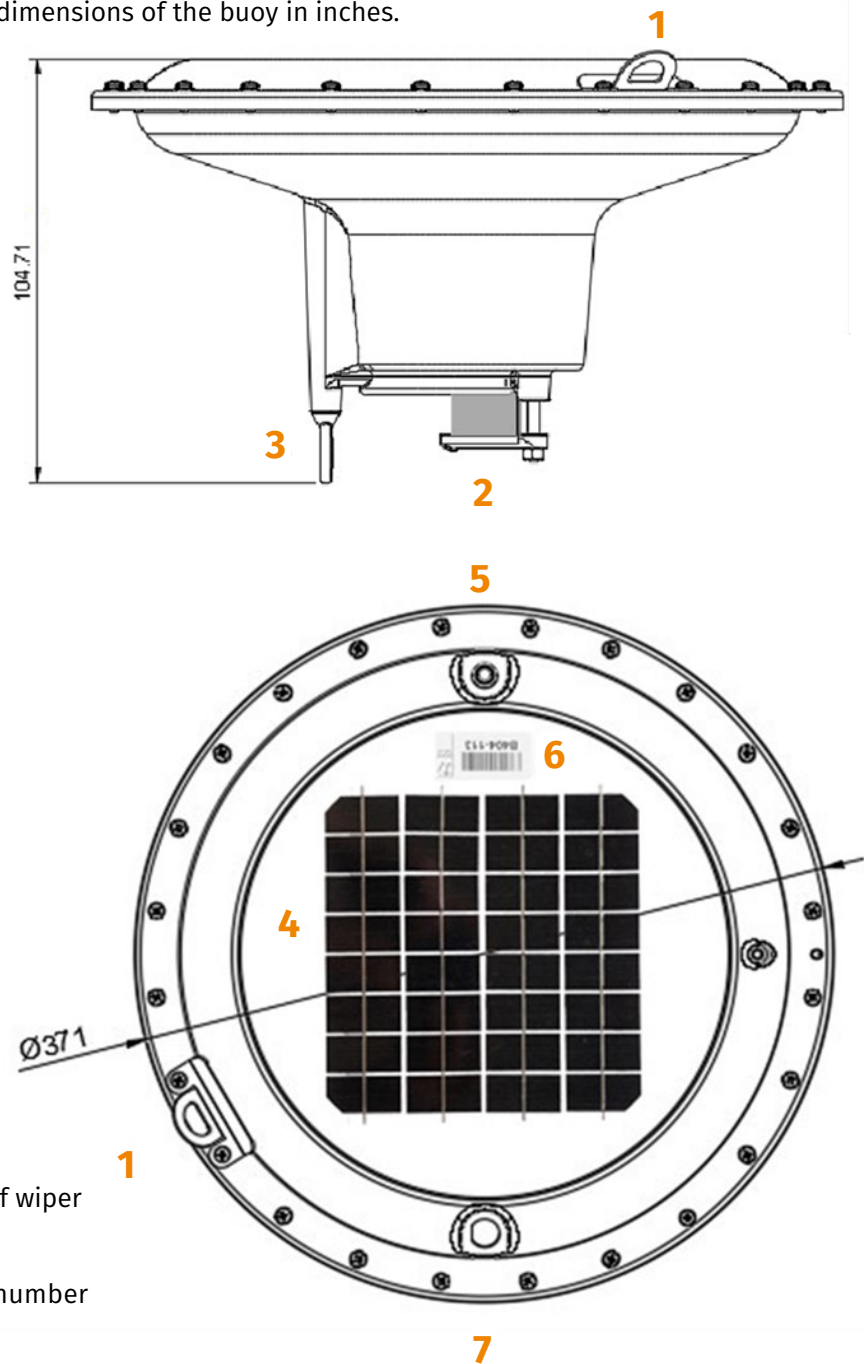
Fluorescence measurement techniques are ideal for researchers who are interested in detecting the presence or absence of a specific substance and measuring relative fluorescence changes that can be used as an indication of increasing or decreasing concentrations.

Fluorescence measurement techniques are not ideal for quantitative measurement. In order to obtain more accurate results, data obtained with the fluorometer in the field should be post-calibrated with data from standard laboratory analysis of field samples acquired during the study.

If field sample data is available, the field sample data should be put in on the calibration option in the webportal in order to improve the accuracy of future readings.

2.3 Product overview

The drawing shows the dimensions of the buoy in inches.



- Parts of the buoy:
1. Attachement ring
 2. Wiper
 3. Ring for protection of wiper
 4. Solar cell
 5. Power button
 6. Sticker with serial number and bar code
 7. Antenna

2.4 Technical specifications

| Device features | Specification | |
|---------------------------|--|----------------------------|
| <i>Sensors</i> | <i>Range</i> | <i>Resolution</i> |
| Green algae (chlorofyl-a) | 0 - 200 µg/l or 0 - 2,000 RFU | 0.1 µg/l or 0.1 RFU |
| Blue algae (phycocyanin) | 0 - 1,500 µg/l or 0 - 750 RFU | 0.1 µg/l or 0.1 RFU |
| Turbidity | 0 - 200 NTU | 0.1 µg/l or 0.1 RFU |
| Ambient light (PAR)* | 0 - 2,000 µE/m ² /sec | 0.1 µE/m ² /sec |
| Water temperature | 0 °C - 50 °C, resolution 0.1 °C | 0.1 °C |
| Air temperature | 0 °C - 50 °C, resolution 0.1 °C | 0.1 °C |
| GPS coordinates | WGS-84 | 2.5 m |
| Measure frequency | 1x every 30 minutes | |
| Transmission frequency | 1x every 2 hours | |
| Battery | 4.2 V, life time 3 years | |
| Power Supply | Solar panel 4.3 Watt** | |
| Housing | Delrin | |
| Diameter | 35 cm (14 inch) | |
| Height | 18 cm (7 inch) | |
| Weight | 3.6 kg (8 lbs) | |
| Data transmission | Via 2G/3G (Integrated modem Incl. SIM) | |
| Mobile coverage | Most countries | |
| Operating temperature | -2 °C to + 45 °C | |
| Storage temperature | -10 °C to + 50 °C | |
| Putting into operation | Push button and green LED lamp | |

* Photosynthetically Active Radiation

** The buoy will run stand alone year round as long as the location is not cold enough to ice up the water. It can work for 2 to 3 weeks without sunlight from 100% battery capacity

2.5 Accessories

For the buoy, the accessories below are available at Royal Eijkelpamp.

| Article number | Accessory |
|----------------|---|
| 181170 | Accessory set for BGA Buoy, set to protect and anchor Scuba BGA buoy. Contains orange lifebuoy with hard shell, 4x stainless steel mounting wire + clips, anchoring rope 30 m and weight bag. |
| 18117001 | Lifebuoy round orange ø 60x40 cm, highly visible and robust buoy with hard shell, Polyethylene with polyurethane foam, fitted with Solas reflection tape. Weight 2.5 kg |
| 18117002 | Stainless steel wire with clips, for attaching Scuba BGA to outside buoy, 4x 50 cm stainless steel wire, 4x clips and 4x D-clasp. |
| 18117003 | Anchor line ø10 mm with stainless steel stocking 30 m, incl. D-clasp 8 mm. For attachment to outer buoy and anchor bag, breaking strength 1600 kg. Color white/black. |
| 18117004 | Anchor bag with 6m anchor line, for Scuba BGA buoy, to be filled with sand or stones |
| 181181 | Replacement brush for Scuba BGA, with mounting nut |
| 181182 | Antenna, for Scuba BGA buoy |
| 181183 | Bucket black, rubber 7.5 liter, for calibration Scuba BGA buoy 2.5 m |

3. Installation

3.1 Setup

We recommend verifying field measurement site requirements prior to installation.

Place the Scuba BGA buoy at an intake point of a water management area, at a swimming beach, in a city pond, or where algal blooms have occurred in the past. The staging area must meet the following minimum requirements:

- Water depth of at least 91 cm (3 feet)
- Direct sunlight available most of the day
- Not in a crowded environment
- Sufficient range for mobile communication

The buoy is powered by a solar panel that charges an internal battery. A connection to the power grid is therefore not necessary.

3.2 Installing buoy

3.2.1 General installation guidelines

Installation of the Scuba BGA buoy requires installation or selection of a fixed object, such as an anchor, navigation buoy or other object, to which the Scuba BGA buoy is attached, called the “anchor point”. Place an orange buoy around the Scuba BGA buoy as a marker for other water users (boats, swimmers, fishermen).

The Scuba BGA buoy has a ring on the top cover and the bottom. The top ring is called the attachment ring. Only the top attachment ring should be used for tethering, not the bottom ring. The lower ring is used to protect the window from impact during handling and may sometimes be used to attach a counterweight to stabilize the Scuba BGA buoy. The Scuba BGA buoy must be attached via a secondary ‘counterweight’ or via a ring buoy (‘Life Ring’). These can be supplied by Royal Eijkelkamp as the 181170 Accessory set BGA.

3.2.2. Installation accessory set-BGA

Choose this option when waves from boats or wind may be higher than 12 inches or 30 cm, or if you do not know the wave status. Also choose this option when the Scuba BGA buoy may be hit by objects or collide with other objects, such as hard walls or boats. The Scuba BGA buoy comes with 4 mounting rings.

Parts included in the accessory set-BGA:

- 1x 18117001 Lifebuoy, 60 cm diameter
- 1x 18117002 stainless steel wire with clips
 - 4x stainless steel wire Ø1mm, 50 cm, stainless steel 316
 - 4x clips, stainless steel 303
 - 8x Spherical cylinder screw with Phillips cross slot DIN 7985-H Stainless steel (SS) A2 M3X6
 - 5x D-latch 8 mm, stainless steel
- 1x 18117003 Anchor line with stainless steel stocking, 30m
- 1x 18117004 Anchor bag

3.2.3. Instructions

Follow these instructions to mount the lifebuoy to the Scuba BGA buoy:

- Attach the lifebuoy to the Scuba BGA buoy
- Remove the 4 white rope pieces from the lifebuoy
- Attach the 4 pieces of stainless steel wire through the existing holes of the lifebuoy every 90° by clamping these wires with the 4 clamps by passing the wire through and clamping them with the 2 screws

- The four mounting rings of the Scuba BGA buoy should be attached to the lifebuoy using 4 of the supplied D-clasp 8 mm. Tighten only by hand. Do not over-tighten to prevent them from getting stuck during prolonged use

Important: point the Scuba BGA buoy cleaning brush downstream in wind or current conditions for reducing the likelihood of debris sticking to the brush

- Attach the lifebuoy to your anchor point
- The lifebuoy should be attached to the anchor point using the 30 m of anchor line provided
- Cut the anchor line to the appropriate length for your application. Leave enough slack so that the Scuba BGA buoy can move back and forth, even with varying water levels.
- The connection of the cable to the anchor point is left to the user as it is dependent on the anchor point.
- If the anchor bag is going to be used fill it with sand or stones. Possibly the length of the cable attached to the anchor bag is sufficient for the placement, otherwise it can be extended with the supplied 30m anchor line (if necessary, a 50m anchor line is also available).

Important: Attach the anchor line connection only to the lifebuoy NOT to the Scuba BGA buoy.

3.3 Enabling buoy

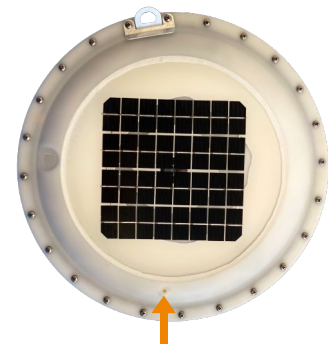
Before turning on the buoy, remove all objects from the area because the brush will rotate once it is turned on.

To turn on the buoy, follow these instructions:

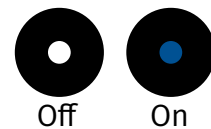
- Locate the power button on the lid of the Scuba BGA buoy
- Press and hold the power button for 8 seconds until the blue LED in the center of the button lights up.
- Release the button. The blue LED turns off when the button is released to conserve battery power.

To turn off the buoy:

- Press and hold the power button for 8 seconds. When turned on, the blue LED dot will light up and turn off after 8 seconds.
- Release the button.



Power Button



Important: Be sure to turn off the device when not in use to conserve battery power

To know whether the buoy is on or off, press the on/off button for 2 seconds. If the buoy is on, the blue LED will light up while the button is pressed. If it is not on, the LED will not illuminate. The LED will never illuminate if the button is not pressed.

While pressing the power button, make sure not to completely cover the dot in the center of the blue LED with your finger so that you can see that the dot turns on or off.


3.4 Access to data

- The webportal can be reached at algae.royaleijkelkamp.com
- Enter the login information provided by Royal Eijkelkamp for your account
- To reset your account information, contact Royal Eijkelkamp
- Select your device from the drop down menu
- Data will be completed within a few hours of switching on the Scuba BGA buoy as long as mobile data is available at the site.

4. Web portal for data presentation

The webportal shows a dashboard that contains the following items:

- Device data (device name, online status, signal strength, battery status)
- Map with location (map, satellite, location pointer, streetview)
- Weather forecast (current, 5 day forecast)
- Parameters (PC (Phycocyanin), CA (chlorophyll-a), turbidity, air and water temperature, ambient light).

You can set an alarm (minimum, maximum) for each parameter via the -symbol

- Graphs with history of measured parameters.
- Graph with historical data of power supply (battery, solar panel)
- Graph with historical data of signal strength modem and ambient light

Under the graphs, the following 6 options are available:

1. Add weather condition and maintenance round
2. Calibrate device
3. Refresh settings
4. Change date range graphs
5. Download data to computer. This is for exporting the data to a CSV file of a specific measurement period
6. Customize graph properties (temperature (F/C), water temperature trend (on/off), turbidity trend (on/off), show graph format, show playground graph)

All options are briefly explained below:

Re 1 Adding weather conditions and maintenance round

Here you can enter abnormal weather conditions and maintenance work.

Re 2 Calibrate device

Through this option you calibrate the buoy for phycocyanin, chlorophyll-a and turbidity. There are 2 options for this which are further detailed in chapter Calibration.

Re 3 Refresh settings

Refreshes the dashboard settings after making changes.

Re 4 Change date range graphs

Here you can change the date range of the graphs for the desired measurement period.

Re 5 Download data to computer

Here you can download and export the measurement data of a specific measurement period to a CSV file.

Re 6 Adjust graph properties

Here you can adjust the following properties of the graphs:

- Temperature (F/C)
- Water temperature trend (on/off)
- Turbidity trend (on/off)
- Show graph format
- Show playground graph

5. Maintenance

5.1 Maintenance frequency

The maintenance frequency is once a year at the end of the measurement period. Maintenance consists of cleaning and calibrating the buoy. If the buoy is used for drinking water basins with moderate food enrichment, you must take into account 2 to 4 times a year calibration of the buoy, because often from legislation stricter requirements are imposed on the measurements.

5.2 Cleaning

To clean the Scuba BGA buoy, follow the instructions below:

- Turn off the device by holding the power button for 8 seconds (the green light turns off)
- Use a cleaning brush with nylon bristles to brush clean the measuring window, brush and base of the buoy unit
- Remove any remaining weeds from the buoy
- For hard-to-remove biological fouling or iron deposits, use boat hull cleaner (we use [Star Brite](#)) and a kitchen scrubber (Blue Scotch-Brite non-scratch scouring sponge)
- To use the hull cleaner, you would first spray the cleaner on all the surfaces, let it soak in 5 minutes, then proceed with cleaning

5.3 Spare parts

The spare parts for the buoy are given in the table below.

| Article number | Spare part |
|----------------|--|
| 181181 | Replacement brush for Scuba BGA, with mounting nut |
| 181182 | Antenna, for Scuba BGA buoy |
| 181183 | Bucket black, rubber 7.5 l, for calibration Scuba BGA buoy |

5.4 Changing lithium battery pack

The lithium ion battery pack in the Scuba BGA buoy is charged by the solar panel and has a life time of 3 years. If the battery is not chargeable anymore, you have to send the buoy for service to Royal Eijkelpark to change the battery. Our technicians are trained for changing the battery pack and watertight sealing of the buoy again.

6. Calibration

You can calibrate the buoy for phycocyanin (blue-green algae), chlorophyll-a (green algae) and turbidity.

There are 2 options for this:

1. Calibration by field measurement
2. Calibration using Rhodamine and turbidity solutions

The sensors for chlorophyll-a, phycocyanin and turbidity have two calibration points. Careful calibration is essential in order to ensure consistent and reliable results. The sensors must be calibrated at both points in order to set the sensors relative sensitivity and establish its slope.



Important: there is no direct correlation between Rhodamine concentration and the concentration of chlorophyll. Rhodamine is used as a convenient dye for setting the sensitivity of the sensor. The subsequent display of chlorophyll in terms of $\mu\text{g/L}$ is a generalisation based on research and experience. The only way to obtain a true value in terms of $\mu\text{g/l}$ is to correlate the values from the sensors to quantitative data that has been obtained by field measurements or laboratory analysis of field samples, then to apply a ratio between RFU and $\mu\text{g/l}$. See also previous section 2.2 Limitations of Use.

6.1 Calibration by field measurement

Field calibration involves calibrating the buoy based on sampling in the field. This can be done through:

1. An analytical result (e.g. $\mu\text{g/l}$) of a water sample analyzed in a laboratory
2. The measurement result (e.g. $\mu\text{g/l}$) of a portable fluorescence meter (e.g. AlgaeTorch from BBE Moldaenke)

Note: the dashboard in our webportal allows you to use any measurement unit you have from another source.

In this way, the sensors has been corrected for the local conditions and species of chlorophyll-a and phycocyanin.

Royal Eijkelpkamp's Youtube channel has an instructional video on how to calibrate the sensor with a field measurement.

6.2 Calibration using Rhodamine and turbidity solutions

The buoy can also be calibrated for chlorophyll-a, phycocyanin and turbidity with normal Rhodamine and turbidity solutions using our standard calibration bucket (an optical black bucket) as listed in the table below.

| Article number | Calibration fluid |
|----------------|---|
| 186010 | Rhodamine WT dye, concentration 20% (200 g/l), 100 ml |
| 18180155 | Turbidity, Formazin, 4.000 NTU, 1 liter |



Important: Read and follow all the safety instructions and MSDS documentation which is supplied with the Rhodamine WT dye and Turbidity fluids before proceeding.

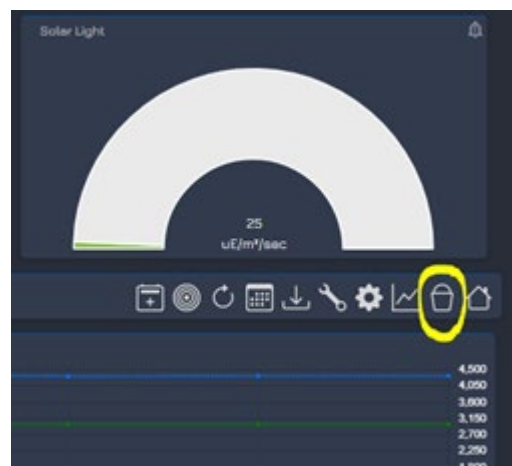
6.2.1 Preparing the calibration environment

The required items for the calibration are:

1. Calibration bucket, article 181183
2. Rhodamine WT 20% solution (200 g/l), 100 ml, article 186010
3. Turbidity 4,000 NTU solution, 1 litre, article 18180155
4. DI (de-ionized) water, 6 litre
5. Tool to measure precise quantities of the solution such as a pipette or other tool
6. One 100 ml and one 400 ml measured glass beaker
7. 10" (25.4 cm) or longer mixing stick

Use the following procedure to prepare a Rhodamine WT solution that will roughly correlate with in situ chlorophyll values:

- Before calibration, the Scuba BGA buoy must be thoroughly cleaned (See the instructions provided in 5.2 Cleaning)
- Place the calibration bucket on a stable flat surface
- Pour 4.2 Liters of DI water into the bucket
- Bring up the Scuba BGA buoy dashboard on a web browser and click the Calibration button
- Power cycle the Scuba BGA Buoy by turning it off then back on
- Wait until the 'Buoy Connected' light on the dashboard turns green
- Prepare a Rhodamine WT 2,5% solution:
 - Take the Rhodamine WT dye 20% solution
 - Pour accurately 125 μl (or 12,5 ml) of the Rhodamine solution into the 100 ml beaker glass
 - Fill it up with DI water till 100 ml and mix it thoroughly to produce a solution that is approximately 25 g/l (is 2,5% solution)



- Prepare the Calibration Standard Solution:
 - Pour accurately 2 ml of the Rhodamine WT 2.5% solution into the 400 ml beaker
 - Fill the beaker with DI water till 400 ml
 - Mix it thoroughly to obtain a solution which is 125 mg/l.

Store the concentrated standard Rhodamine WT dye solution in a refrigerator to retard decomposition. The dilute standard prepared in the previous step should be used within 24 hours of its preparation. When Rhodamine standards are required in the future, perform another dilution of the concentrated Rhodamine solution after warming it to ambient temperature. Our experience has indicated that the concentrated solution that has been kept at cold temperatures is much more stable than the dilute solution stored at room temperature.

6.2.2. Performing the calibration

There are 4 calibration steps to calibration the buoy.

1. Calibration in the **zero solution**, 'Solution 1'

The zero solution is the pure DI water solution.

- Place the Scuba BGA buoy in the calibration bucket, centering it relative to the bucket
- Click the 'Calibrate' button on the dashboard page
 - Wait for the 'Calibration Step Complete' message
 - Click 'Next'

2. Calibration in the **phycocyanin (BGA)** high solution, 'Solution 2'

- Remove the Scuba BGA buoy from the bucket and dry the bottom off
- Add 3 ml of the prepared Rhodamine WT standard calibration solution to the bucket and mix thoroughly to obtain a solution which is approximately 89,3 µg/l. Use 30 brisk circles of the mixing stick then reverse direction slowly to stop the water movement. Allow to settle for 10 seconds
- Place the Scuba BGA buoy in the calibration bucket, centering it relative to the bucket
- Click the 'Calibrate' button on the dashboard page
 - Wait for the 'Calibration Step Complete' message
 - Click 'Next'

3. Calibration in the **chlorophyll-a** high solution, 'Solution 3'

- Remove the Scuba BGA buoy from the bucket and dry the bottom off
- Add 21 ml of the prepared Rhodamine WT standard calibration solution to the bucket and mix thoroughly to prepare a solution which is approximately 714 µg/l. Use 30 brisk circles of the mixing stick then reverse direction slowly to stop the water movement. Allow to settle for 10 seconds
- Place the Scuba BGA buoy in the calibration bucket, centering it relative to the bucket
- Click the 'Calibrate' button on the dashboard page
 - Wait for the 'Calibration Step Complete' message
 - Click 'Next'

4. Calibration in the **turbidity** high solution, 'Solution 4'

- Remove the Scuba BGA buoy from the bucket and dry the bottom off
- Add 50 ml of the turbidity solution to the bucket and mix thoroughly to obtain a solution which is approximately 47 NTU/l. Use 30 brisk circles of the mixing stick then reverse direction slowly to stop the water movement. Allow to settle for 10 seconds
- Place the Scuba BGA buoy in the calibration bucket, centering it relative to the bucket
- Click the 'Calibrate' button on the dashboard page
 - Wait for the 'Calibration Step Complete' message
 - Click 'Next'.

The calibration is now complete. Click on the button 'Back to dashboard'.

6.3 Customer service contact information

If after reading this manual you still have questions about buoy maintenance or calibration, please feel free to contact us at:

Royal Eijkelkamp, Service Department
T: +31 313 800 200
E: service@eijkelkamp.com
I: royaleijkelkamp.com/nl/service-verhuur/

7. Storage and transportation

7.1 Storage

To store the buoy, follow the instructions below:

- Clean the device thoroughly before storing it, as described in Cleaning (Chapter 5.2)
- Switch off the device by pressing and holding the power button for 8 seconds (the green light goes out)
- Rotate the brush so that it does not touch the base or measurement window, as shown in the illustration.
- Remove the antenna and store the tracker in the original box. If you do not have the original box, an 8-10" bucket will work for storage as long as the brush does not touch the bottom.



7.2 Transportation

To send the buoy, follow the instructions below:

- Follow the steps for Cleaning and Storage.
- The Scuba BGA buoy should only be shipped in its original box. Packing with loose padding almost always results in damage to the buoy.
- If you do not have the original box, please let us know at service@eijkelkamp.com
- Orient the mounting ring(s) on the corners of the box as shown in the image.
- Place the antenna in one of the corner slots of the shipping box.
- Place the cardboard insert over the unit. Note, if it is difficult to get the insert in, the insert may touch the seam of the box shown in the upper left corner of the image.
- Close the box and secure it with 3" packing tape.
- Box dimensions: 40.64 x 40.64 x 27.94 cm (16x16x11 inches), 4.54 kg (10 pounds)
- Send to this address:

Royal Eijkelkamp
Service Department
Nijverheidstraat 9
6987 EN Giesbeek
The Netherlands



Appendix 1: Certificate

To be defined.



Division of Kingscote Chemicals ®

**WATER TRACING DYE
FWT RED PRODUCTS**

TECHNICAL DATA BULLETIN

Bright Dyes FWT Red products are proprietary formulations of Rhodamine dyes. Our Bright Dyes FWT Red liquid products are specially formulated versions of Rhodamine WT dye for convenient use in water tracing and leak detection studies. This bright, fluorescent red dye is certified by NSF International to ANSI/NSF Standard 60 for use in drinking water. It may be detected visually, by ultraviolet light and by appropriate fluorometric equipment. Today it is most often used visually. Visually the dye appears bright pink to red, depending on its concentration and under ultraviolet light as bright orange.

The dye is resistant to absorption on most suspended matter in fresh and salt water. Compared to Bright Dyes FLT Yellow/Green products it is significantly more resistant to degradation by sunlight and when used in fluorometry, stands out much more clearly against background fluorescence. As always the use and suitability of these products for any specific application should be evaluated by a qualified hydrologist or other industry professional.

| General Properties | Tablets | FWT Red 25 Liquid | Powders |
|---|------------------------------------|------------------------------------|------------------------------------|
| Detectability of active ingredient ¹ | Visual <100 ppb | Visual <100 ppb | Visual <100 ppb |
| Maximum absorbance wavelength ² | 550/588 nm | 550/588 nm | 550/588 nm |
| Appearance | Dark red convex 1.6cm diameter | Clear dark red aqueous solution | Dark red fine powder |
| NSF (Max use level in potable water) | 0.3 ppb | 0.8 ppb | 0.1 ppb |
| Weight | 1.35 gms ± 0.05 | | |
| Dissolution Time ³ | 50% < 3 minutes 95% < 6 minutes | | 50% < 3 minutes 95% < 6 minutes |
| Specific Gravity | | 1.03 ± 0.05 @ 25° C | |
| Viscosity ⁴ | | 1.3 cps | |
| pH | | 8.7 ± 0.5 @ 25° C | |

| Coverage of Products | One Tablet | One Pint Liquid | One Pound Powder |
|----------------------|-------------|-----------------|------------------|
| Light Visual | 604 gallons | 31,250 gallons | 600,000 gallons |
| Strong Visual | 60 gallons | 3,125 gallons | 60,000 gallons |

Caution: These products may cause irritation and/or staining if allowed to come in contact with the skin. The use of gloves and goggles is recommended when handling this product, as with any other dye or chemical.

To our best knowledge the information and recommendations contained herein are accurate and reliable. However, this information and our recommendations are furnished without warranty, representation, inducement, or license of any kind, including, but not limited to the implied warranties and fitness for a particular use or purpose. Customers are encouraged to conduct their own tests and to read the material safety data sheet carefully before using.

¹ In deionized water in 100 ml flask. Actual detectability and coverage in the field will vary with specific water conditions.

² No significant change in fluorescence between 6 and 11 pH.

³ (One tablet, 1 gram of powder), in flowing deionized water in a 10 gallon tank.

⁴ Measured on a Brookfield viscometer, Model LV, UL adapter, 60 rpm @ 25° C.

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1. Identification

Product Identifiers

Product Name: Bright Dyes® FWT Red 25 Liquid

Product Number: 106023

Recommended Use & Restrictions on Use

Water tracing & leak detection dye

Manufacturer/Supplier

Kingscote Chemicals, Inc.
3334 South Tech Blvd.
Miamisburg, OH 45342
U.S.A.

Emergency Telephone Number

Company Telephone Number: (937) 886-9100

Emergency Telephone (24 hr): INFOTRAC (800) 535-5053 (North America)
+1-352-323-3500 (International)

2. Hazards Identification

Classification

This chemical does not meet the hazardous criteria set forth by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). However, this Safety Data Sheet (SDS) contains valuable information critical to the safe handling and proper use of this product. This SDS should be retained and available for employees and other users of this product.

3. Composition/Information on Ingredients

This product is not hazardous according to OSHA 29 CFR 1910.1200. Components not listed are not hazardous or are below reportable limits.

4. First-Aid Measures

First-Aid Measures

| | |
|---------------------|--|
| Eye Contact | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists: Get medical advice/attention. |
| Skin Contact | Wash thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. |
| Inhalation | Remove to fresh air. If breathing is difficult, administer oxygen; seek medical attention immediately. |

Ingestion Rinse mouth. DO NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention if large quantities were ingested or if nausea occurs.

Most Important Symptoms and Effects

Symptoms Will cause staining of the skin on contact. May cause eye irritation. Inhalation of dust may cause respiratory irritation. Ingestion may cause urine to be a red color until the dye has been washed through the system.

Indication of Any Immediate Medical Attention and Special Treatment Needed

Notes to Physician Treat symptomatically.

5. Fire-Fighting Measures

Suitable Extinguishing Media

Water spray (fog). Carbon dioxide (CO₂). Dry chemical. Regular foam.

Unsuitable Extinguishing Media

Not determined

Specific Hazards Arising from the Chemical

Product is not flammable. Burning/combustion may produce oxides of carbon and nitrogen (NO_x).

Protective Equipment and Precautions for Firefighters

Wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures

Personal Precautions Use personal protective equipment as recommended in Section 8.

Environmental Precautions Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12 and Section 13.

Methods and Material for Containment and Cleaning Up

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Sweep up and collect into suitable containers for disposal. Flush area with water.

7. Handling and Storage

Precautions for Safe Handling

Advice on Safe Handling Handle in accordance with good industrial hygiene and safety practices. Use personal protection recommended in Section 8. Avoid contact with skin, eyes, or clothing. Avoid breathing dusts. Contaminated clothing should be thoroughly washed before reusing.

Conditions for Safe Storage, Including Incompatibilities

| | |
|-------------------------------|---|
| Storage Conditions | Keep container tightly closed and store in a cool, dry, and well-ventilated area. Keep from freezing. |
| Incompatible Materials | No materials to be especially mentioned |

8. Exposure Controls / Personal Protection**Exposure Guidelines**

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Controls

Ensure adequate ventilation, especially in confined areas. Eyewash stations. Showers.

Individual Protection Measures, Such as Personal Protective Equipment:

| | |
|-----------------------------------|---|
| Eye/Face Protection | Goggles. |
| Skin & Body Protection | Rubber gloves. Suitable protective clothing. |
| Respiratory Protection | No protection is ordinarily required under normal conditions of use. |
| Hygiene Measures | Handle in accordance with good industrial hygiene and safety practices. |

9. Physical and Chemical Properties**Information on Basic Physical and Chemical Properties**

| | | | |
|-----------------------|-----------------|-----------------------|----------------|
| Physical State | Liquid | Odor | Mild |
| Appearance | Dark red liquid | Odor Threshold | Not determined |
| Color | Dark red | | |

| Property | Values |
|----------------------------------|-------------------------|
| pH | 8.6 – 8.8 |
| Melting/Freezing Point | Not determined |
| Boiling Point/Range | Not determined |
| Flash Point | Not applicable |
| Evaporation Rate | Not applicable |
| Flammability (solid, gas) | Liquid – not applicable |
| Upper Flammability Limits | Not applicable |
| Lower Flammability Limits | Not applicable |
| Vapor Pressure | Not applicable |
| Vapor Density | Not applicable |
| Relative Density | Not applicable |
| Specific Gravity | Not determined |
| Solubility | Highly soluble in water |
| Partition Coefficient | Not determined |
| Auto-ignition Temperature | Not determined |
| Decomposition Temperature | Not determined |
| Viscosity | Not determined |

10. Stability and Reactivity

Reactivity

Not reactive under normal conditions.

Chemical Stability

Stable under recommended storage conditions.

Possibility of Hazardous Reactions

None under normal processing.

Conditions to Avoid

Keep separated from incompatible substances. Keep out of reach of children.

Incompatible Materials

No materials to be especially mentioned

Hazardous Decomposition Products

Oxides of carbon and nitrogen (NOx).

11: Toxicological Information

Information on Likely Routes of Exposure

| | |
|---------------------|--------------------------------------|
| Inhalation | Avoid breathing vapors or mists. |
| Ingestion | Do not ingest. |
| Skin Contact | May cause an allergic skin reaction. |
| Eye Contact | Avoid contact with eyes. |

Delayed, Immediate, and Chronic Effects from Short- and Long-Term Exposure

May cause an allergic skin reaction.

Numerical Measures of Toxicity

Not determined

Symptoms Associated with Exposure

See Section 4 of this SDS for symptoms.

Carcinogenicity

| | |
|-------------|------|
| NTP | None |
| IARC | None |
| OSHA | None |

12. Ecological Information**Ecotoxicity**

This product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Component Information

Not available

Persistence/Degradability

Not determined

Bioaccumulation

Not determined

Mobility

Not determined

Other Adverse Effects

Not determined

13. Disposal Considerations**Waste Disposal Methods**

Dispose of in accordance with federal, state, and local regulations.

Contaminated Packaging

Do not re-use empty containers. Dispose of containers in accordance with federal, state, and local regulations.

14. Transport Information**Note**

See current shipping paper for most up-to-date shipping information, including exemptions and special circumstances.

| | |
|-------------|---------------|
| DOT | Not regulated |
| IATA | Not regulated |
| OMDG | Not regulated |

15: Regulatory Information**International Inventories**

| | |
|-------------|--------|
| TSCA | Listed |
|-------------|--------|

U.S. Federal Regulations

| | |
|---------------|--|
| CERCLA | This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). |
|---------------|--|

SARA 313 Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

CWA (Clean Water Act) This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

U.S. State Regulations

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know This product does not contain any substances regulated under applicable state right-to-know regulations.

16: Other Information

HMIS

| Health Hazards | Flammability | Instability | Special Hazards |
|----------------|--------------|-------------|-----------------|
| 1 | 0 | 0 | Not determined |

NFPA

| Health Hazards | Flammability | Physical Hazards | Personal Protection |
|----------------|--------------|------------------|---------------------|
| 1 | 0 | 0 | B |

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Revision Note Biennial Review

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet