User Manual for the

Raingauge

*type **RG2***

RG2-UM-1.1

Delta-T Devices Ltd

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Patents

This raingauge is protected by copyright law and the following patents: Patent No. UM-27589, AU Pat. 565951, EPO Pat. 014212, US Pat. 4.644.786, CA Pat. 126181, Japan Pat. 501208/83, Taiwan Reg. 74-201292. Components may not be used for other products or purposes without written approval from the manufacturer.

CE conformity

The sensor described in this document is a passive component as defined by the EU EMC Directive 89/336/EEC and is not CE marked.

When used with Delta-T logging systems according to the instructions contained in this document, the sensor does not significantly affect the EMC performance when assessed under EN 50081 and EN 50082.

If the sensor is used with any other measuring equipment, it is the responsibility of the user to ensure the EMC compliance of any such measuring systems.

Design changes

Delta-T Devices Ltd reserves the right to change the designs and specifications of its products at any time without prior notice.

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Introduction

Summary of Features

The RG2 raingauge is a professional quality raingauge for ground level or mast mounting, with the following features:

- Patented tipping spoon mechanism
- Scientifically designed rain collector funnel
- Precipitation measurements to ± 2% accuracy
- Self-emptying and frost proof
- Styrosun material gives UV, heat, and frost resistance in all climatic conditions
- Standard line replacement item
- Ideal for agro-meteorological uses

Scope of This Manual

This manual contains the specifications and performance of the RG2, and describes its installation with Delta-T data loggers.

You may also need to refer to the Delta-T logger User Manual or On-line Help.

Installation

Unpacking

Check for any damage that may have occurred to the consignment in transit. Check that the contents of the consignment agree with the Packing List.

If any damage or shortage is apparent, notify the distributors and the carriers immediately.

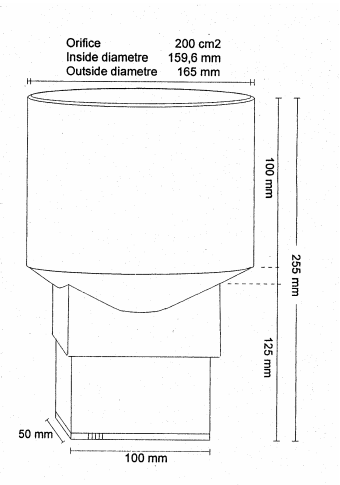
Make a note of the sensor(s) serial number(s), and check that the cable supplied is the length that was ordered. The serial numbers will be needed in any subsequent warranty claims, repairs or recalibration.

The parts supplied may include:

- RG2 raingauge, fitted with the length of cable you ordered, including angle brackets
- Baseplate for ground mounting
- Mast mounting bracket

Description of Equipment

Outline Diagram:



The raingauge collects rainfall in the funnel, which leads the water down through a grill into a self-emptying spoon. The spoon is held in place by a magnet, which always exerts enough tension to allow the measuring spoon to empty in one quick movement (<300 ms), and then to return to its original position to collect more rain. The spoon automatically tips everytime there is exactly the specified weight of water in it.

The raingauge consists of three main parts:

- the funnel collector (push-fit attachment to base)
- the base box
- the measuring spoon assembly.

Full internal construction details are give in the section on Specifications.

Mounting the Sensor

Mounting Considerations

The RG2 is supplied with aluminium angle brackets to fit the box at the base of the unit. You can use these to mount the raingauge on any suitable horizontal surface.

Four M4 mounting holes at 30 mm x 138 mm rectangular pitch spacing are provided by the angle brackets.

Ground mounting is generally preferred. It is scientifically accepted that a raingauge mounted at 1.5 m above ground will collect about 7% less rain than an identical unit mounted on the ground.

Mount the raingauge with its axis vertical. Small deviations from the vertical will not significantly affect the accuracy of rainfall collection. Use a spirit level across the top of the funnel to verify the alignment, if necessary.

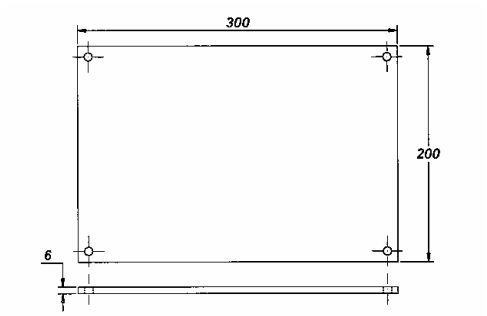
Note that water emerges from the slots in the base during rainfall.

Warning! *Do not block the slots in the base of the unit. Take care to prevent blockage by insect or leaf debris.*

Baseplate type RG2-BP

This is a rectangular Foamex plate of durable plastic, for mounting the raingauge on the ground.

Attach the raingauge to the base plate holes (countersunk underneath), using four countersunk screws and nuts provided.

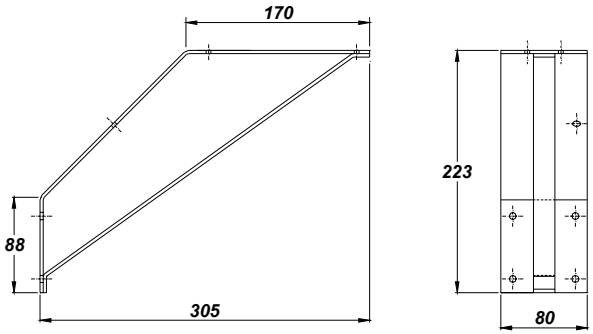


Secure the baseplate to the ground or soil with four spikes using the corner mounting holes. Finally, make sure the raingauge is vertical.

Mast Mount type RG2-M

This mount can be used on the Delta-T M2 Mast, or S/Pole, using the U-bolts provided. In fact, it can be attached to almost any vertical or horizontal pole with a diameter in the range of 30 to 50 mm.

The raingauge centre line is positioned approximately 250 mm from the centre line of the mast.



Use the small amount of play in the U-bolt fittings to ensure that the raingauge is mounted vertically, even if the support poles are not perfectly aligned.

A typical requirement is to mount the top of the funnel 1.5 m above the ground level. As far as possible, make sure that the raingauge does not shield other sensors on the mast (for example wind sensors), and is not itself shielded from receiving rainfall.

RG2 Sensor Connections

Outline Specs

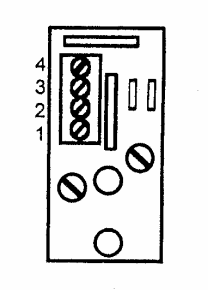
Parameter	Value
Output sensitivity	0.2 mm rain per tip (contact closure)

Sensor Wiring

The raingauge is fitted with 6m of 2-core cable, with bare wire ends as standard. The cable cores may have a variety of colours. The switch wiring polarity is not important.

Two reed switches are fitted, one with “normally open” (NO) contacts, the second with “normally closed” (NC) contacts. 1 kΩ resistors are fitted in series with each switch.

Use only the NO terminal connections 3 and 4 for the Delta-T DL2e data logger.



Conductor	Terminal	Function	Notes
Either	4	Switch NO	1 kΩ resistor in series with switch contacts inside the RG2
Either	3	Switch NO Common	
	2	Switch NC	Not used
	1	Switch NC Common	Not used
Screen			None

Cable

Up to 100m of cable can be fitted at time of ordering. Cable can be extended with similar cable, provided the joint is waterproof, up to the 100 metre limit.

Data Requirements

Typical common usage:

Rainfall amount	Log hourly or daily totals, in mm of rain.
Rainfall intensity	Log totals more frequently, e.g. at 1 or 5 minute intervals

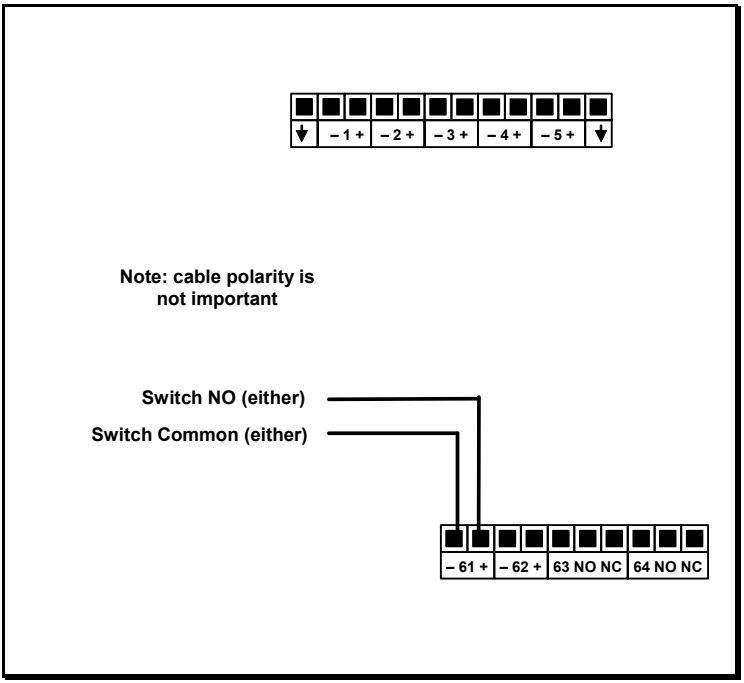
Logger Connections

DL2e Logger

Use with DL2e Counter Channels

This diagram shows the wiring connections for the DL2e onboard counter channels 61 or 62. For the DLC1 Counter Card, follow identical principles, and refer to the DL2e Logger Documentation and Ls2Win on-line Help.

RG2 Wiring Schematic for DL2e



Settings

The example shows the RG2 sensor output connected to counter channel number 61 in the DL2e logger. Either wire can be connected to the channel input terminals. The cable polarity is not important.

DL2e Sensor Code

RG2

When creating your DL2e logger program with the Ls2Win software, check the sensor library for the RG2 code.

If the RG2 sensor code is already present, you can use it in your logger program with any of the two on-board counter channels, or with channels on the DLC1 Counter card. Then choose suitable logging sampling and logging intervals (see *data requirements*) in your logging program.

If the RG2 code is not present in your sensor library, you must first import it from a sensor library of additional sensor codes provided by Delta-T. Check with Delta-T for the latest version of the Ls2Win software and sensor libraries.

***Note**: If your Ls2Win sensor library does not contain the RG2 code, you can use the RG1 code instead. It will give correct results.*

Other Loggers

For making connections to other data loggers, please follow the general principles laid out above.

Specifications

RG2 Specification Table

Parameter	Notes
Sensitivity	0.2 mm per tip
Accuracy	± 2% when correctly adjusted
Capacity per minute	2.4 mm with 12 tips
Rainfall intensity range	0 to 6 mm per minute (see Fig 1)
Signal type	Reed switch closure (NO), or closed (NC)
Operating time	(NO) 255 ms, (NC) 190 ms
Raingauge material	Styrosun: UV, frost and heat resistant in all environmental conditions
Funnel orifice area	200 cm²
Funnel diameter	159.6 mm (inside), 165 mm (outside)
Funnel depth	175 mm
Overall height	255 mm
Base area	50 x 100 mm
Weight (excl cable)	380 g
Base mounting	M4x16 screws and nuts, 4 off
Cable type	2-core, unscreened
Terminations	Bare wires
Cable length	6 m standard, 100 m max

RG2-BP Baseplate

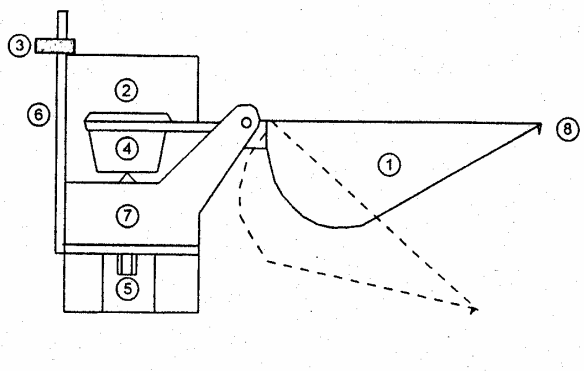
Parameter	Notes
Material	Weather resistant 6 mm white Foamex
Dimensions	300 x 200 mm
Raingauge attachment	M4x16 screws and nuts, 4 off
Ground fixings	Ground spikes 200 mm, 4 off

RG2-M Mast Mount

Parameter	Notes
Mast to gauge distance	Approx 250 mm between centre-lines
Material	Stainless steel, 2.0 mm
Mast fixings	U-bolts for mast dia 30 - 50 mm, 2 off
Raingauge attachment	M4x16 screws and nuts, 4 off

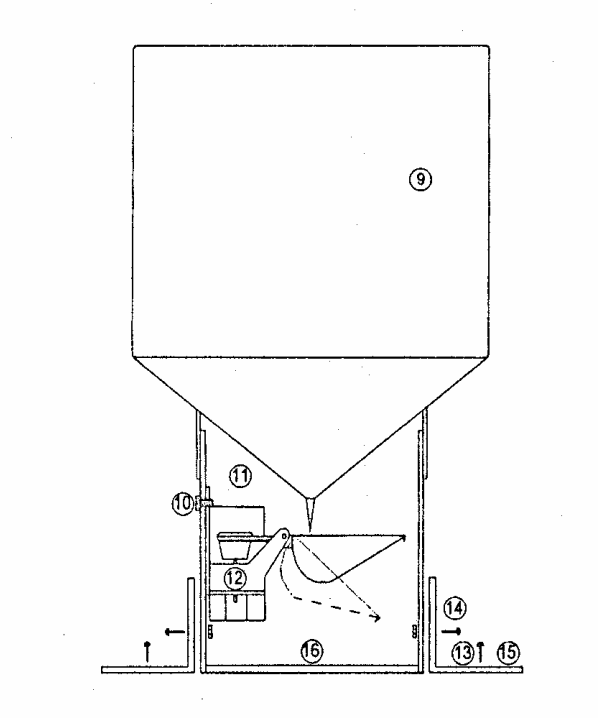
Detailed Construction

Tipping Spoon Mechanism



1. Self-emptying spoon
2. Printed circuit board with reed switches
3. Retaining screw
4. Magnet
5. Adjustment screw
6. Angle brackets
7. Holder for spoon
8. Drip catcher

Section Diagram



9. Funnel with grill
10. Retaining screw
11. Box for measuring unit
12. Measurement unit
13. Angle mounting screw holes (x 4)
14. Angle fixing screws (x4)
15. Angle brackets (x2)
16. Base with grooves for water outlet

Calibration

Different countries have different standards for rainfall measurements and raingauge testing. The RG2 design has been thoroughly tested at the Danish Ministry of Agriculture, Dept of Agricultural Meteorology.

Factory calibration is carefully made using the adjustment screw located beneath the spoon (item 5, see above). The adjustment screw is sealed with red compound, indicating that the adjustment is correctly set for the parameters below.

Calibration Certificates for individual RG2 raingauges are not issued.

Resolution of the rain collector	0.20 mm per tip
Water in the spoon per tip	4.0 g
Number of tips for 0.5 litre	125
Precipitation in mm rain for 0.5 litre	25 mm
Accuracy of setting	Within ±2%

Recalibration

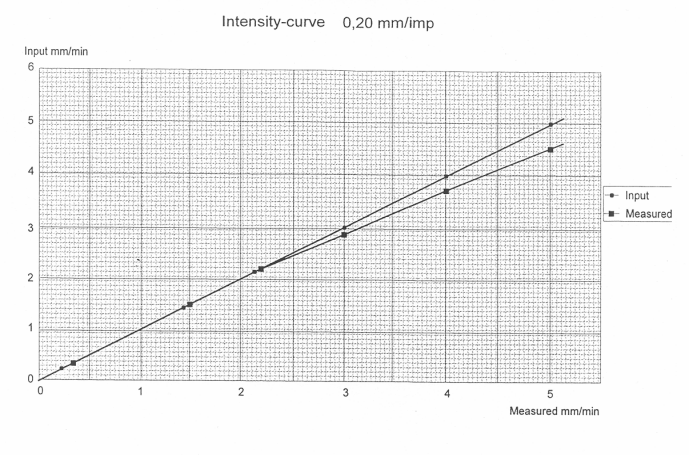
You can check the calibration and adjustment of your RG2 as follows:

- Weigh or measure exactly 0.5 litre (500 ml or 500 g) of water.
- Drip the water slowly into the funnel over a period of about 30 minutes.
- Check the number of tips registered, with an appropriate measuring device connected to the RG2 cable. The correct value is 125 tips.
- Turn the adjustment screw clockwise to increase the number of tips, or anti-clockwise to decrease the number. Do this by small amounts, and repeat the test after each adjustment.

Rainfall Intensity Response

Note that in circumstances where the rainfall rate is very high, the rain amount registered is slightly less accurate, as shown by the chart below. This is a common feature of raingauges employing tipping spoons or buckets, and is not usually a significant factor.

Figure 1



Maintenance

Routine Maintenance

Mostly these are practical considerations:

- Remove accumulations of leaves or vegetation material from the funnel and its grill.
- Remove the funnel and inspect the spoon mechanism. Clear the slots in the base of the unit to allow measured rain to escape.
- Check that the raingauge remains mounted vertically.
- Check the calibration from time to time as described above.

Repairs and Spares

In cases of damage or wear, some components are available as replacement parts. Check with Delta-T.

Warranty and Service

Terms and Conditions of Sale

Our Conditions of Sale (ref: COND: 1/00) set out Delta-T's legal obligations on these matters. Delta-T warrants that the goods will be free from defects arising out of the materials used or poor workmanship for a period of **twelve months** from the date of delivery.

Technical Support

Technical Support is available on Delta-T products and systems. Users in countries that have a Delta-T Distributor or Technical Representative should contact them in the first instance.

Technical Support questions received by Delta-T will be handled by our Tech Support team. Your initial enquiry will be acknowledged immediately with a “T number” and an estimate of time for a detailed reply. Make sure to quote our T number subsequently so that we can easily trace any earlier correspondence.

In your enquiry, always quote instrument serial numbers, software version numbers, and the approximate date and source of purchase where these are relevant.

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Troubleshooting

Problems

Always try to isolate the source of the difficulty. This may fall into one of the following areas:

The Raingauge

- Is the rain getting to the spoon?
- Is the spoon tipping?
- Is the tip action creating a switch closure pulse?

The Cable

- Check for cable damage or connection faults, short circuits or open circuits.

The Data Logger

- Check that the data logger channel in use is correctly configured (counter channel, for switch closure pulses).
- Remove the raingauge connections and connect a manually operated switch instead to check the channel.

Doubtful Readings

- First check all the above, then do a recalibration check.

Symptom	Possible cause or remedy
No output from RG2 raingauge	Check the RG2 tipping spoon mechanism
Zero or low rain readings	Broken cable or intermittent open circuit between sensor and logger.
Wildly variable or high rain readings	Intermittent short-circuit in cable between sensor and logger.
RG2 rain amounts appear incorrect	Recheck the calibration.