

# USER'S GUIDE



## Vaisala Radiosonde RS92-K and RS92-KL



PUBLISHED BY

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# CHAPTER 1

## GENERAL INFORMATION

This chapter provides general notes for the manual and the product.

### About This Manual

This manual provides information for operating the Vaisala Radiosonde RS92-K and RS92-KL.

### Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information: This chapter provides general notes for the manual and the product.
- Chapter 2, Product Overview: This chapter introduces the features and advantages of the radiosonde.
- Chapter 3, Operation: This chapter contains information that is needed to operate this product.
- Chapter 4, Storage and Transportation: This chapter provides information for the transport and storage of the product.
- Chapter 5, Failure Report and Warranty: This chapter presents information about the failure report and radiosonde warranty.
- Appendix A, Safety Instructions for Balloon Operators: This appendix contains details of safe and proper balloon preparation.

## Version Information

**Table 1      Manual Versions**

Manual Code	Description
M210299EN-D	This manual
M210299EN-C	Previous version

## Related Manuals

**Table 2      Related Manuals**

Manual Code	Manual Name
M210329EN	Ground Check Set GC25 User's Guide
M210488EN	Vaisala DigiCORA® User's Guide
M010024EN	DigiCORA II MW15 User's Guide
M210811EN	Configuring and Operating MW11/15 Systems, RS92 Radiosonde, and GC25 Using Cable Connection

## General Safety Considerations

Throughout the manual, important safety considerations are highlighted as follows:

### **WARNING**

Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.

### **CAUTION**

Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

### **NOTE**

Note highlights important information on using the product.

## Feedback

Vaisala Customer Documentation Team welcomes your comments and suggestions on the quality and usefulness of this publication. If you find errors or have other suggestions for improvement, please indicate the chapter, section, and page number. You can send comments to us by e-mail: [manuals@vaisala.com](mailto:manuals@vaisala.com).

## Product Related Safety Precautions

**WARNING**

Conduct soundings in a safe environment and in accordance with all applicable restrictions and regulations.

**WARNING**

Do not use the radiosonde in an area with power lines or other obstructions overhead. Make sure that you check the area for such obstructions before using the radiosonde.

**WARNING**

Do not use the radiosonde without consultation and cooperation with local and other applicable aviation authorities.

**CAUTION**

Do not modify the unit. Improper modification can damage the product or lead to malfunction.

**CAUTION**

Do not use the radiosonde for any purpose other than for soundings.

**NOTE**

Follow the local regulations for radio communications and telecommunications.

## Recycling



Recycle all applicable material.



Dispose of batteries and the unit according to statutory regulations.  
Do not dispose of with regular household refuse.

## License Agreement

All rights to any software are held by Vaisala or third parties. The customer is allowed to use the software only to the extent that is provided by the applicable supply contract or Software License Agreement.

## CHAPTER 2

# PRODUCT OVERVIEW

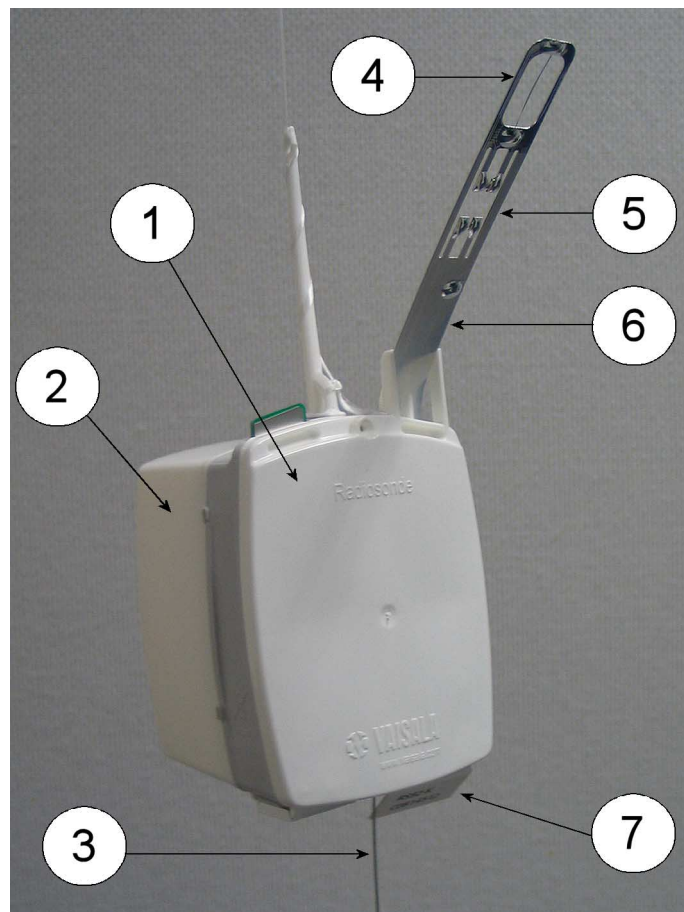
This chapter introduces the features and advantages of the radiosonde.

## Introduction to Vaisala RS92-K and RS92-KL

The Vaisala Radiosonde RS92-K and RS92-KL offer excellent accuracy in humidity, pressure, and temperature measurement. These radiosondes feature a heated twin humidity sensor, a silicon pressure sensor, and a small, fast temperature sensor.

The RS92-KL uses Loran-C windfinding. The RS92-K is used for PTU measurement, and, for example, a radar can be used for windfinding.

The RS92-K and RS92-KL are tuned at the factory to the default frequency of 403 MHz. The frequency can be adjusted within the 400.15 to 406 MHz telemetry band.



**Figure 1      Vaisala Radiosonde RS92-K**

- 1    =    Hole for frequency tuning (covered by tape)
- 2    =    Battery casing
- 3    =    Antenna
- 4    =    Temperature sensor
- 5    =    Humidity sensors
- 6    =    Sensor boom
- 7    =    GC25 interface

The Vaisala Radiosonde RS92-K and RS92-KL can be used with the Vaisala DigiCORA® Sounding System MW31 and MW21, and the Vaisala DigiCORA® Sounding System MW11, MW12, or MW15.

## CHAPTER 3

# OPERATION

This chapter contains information that is needed to operate this product.

### General

It is essential that you carry out the pre-launch steps as instructed and always in the same way. Follow the instructions in the following sections and refer to [Appendix A on page 39](#) for proper and safe balloon preparation.

The workorder for a sounding is as follows:

1. Prepare the balloon and optional sounding accessories.
2. Unpack the radiosonde.
3. Perform sounding preparations.
4. Connect the battery.
5. Launch the radiosonde.
6. Monitor the sounding with the DigiCORA® Sounding System.

## Preparing the Balloon and Optional Sounding Accessories

The balloon and optional sounding accessories must be prepared before connecting the radiosonde battery and thereby activating the radiosonde. This is necessary because the radiosonde should be launched within 15 minutes of battery connection.

### **WARNING**

Read the safety instructions in Appendix A before proceeding. Normally the balloon lifting gas (hydrogen or helium) is supplied in gas bottles, but hydrogen can also be produced with a hydrogen generator. Carefully study the operation and safety instructions for the gas bottle facilities or the hydrogen generator.

Take extreme caution when handling the inflated balloon.

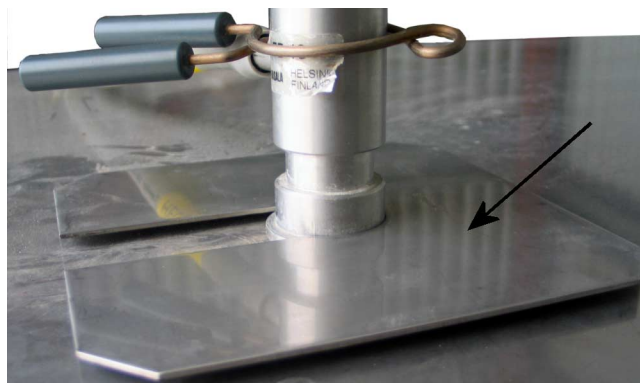
## Balloon Preparation

### **WARNING**

It is recommended that the balloon is prepared in a balloon filling shed. The balloon filling shed must be well ventilated so that possible gas leaks flow out of the shed, even in situations when there is no electricity.

Follow these steps to prepare the balloon:

1. Load weights that are needed to obtain the required lift onto the gas nozzle.



**Figure 2** Loading Weights onto the Gas Nozzle



2. Attach the balloon to the gas nozzle by securing the balloon with a piece of string or a clamp.



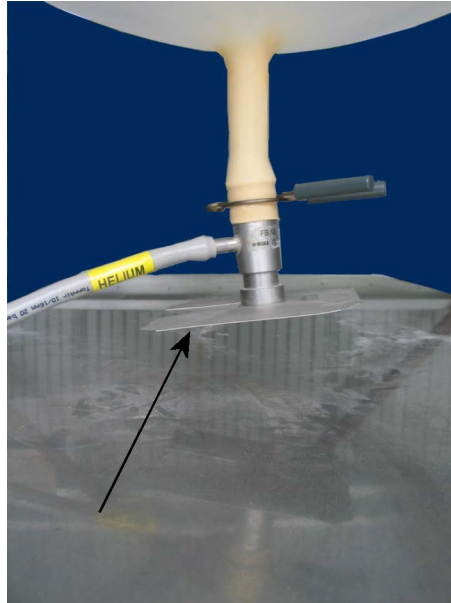
**Figure 3      Attaching the Balloon to the Gas Nozzle**

3. Inflate the balloon following the balloon manufacturer's inflation instructions. Do not leave the balloon-filling shed while inflating the balloon.



**Figure 4      Inflating the Balloon**

4. When the balloon is sufficiently filled, in other words, the balloon just raises the gas nozzle, close the gas valve.

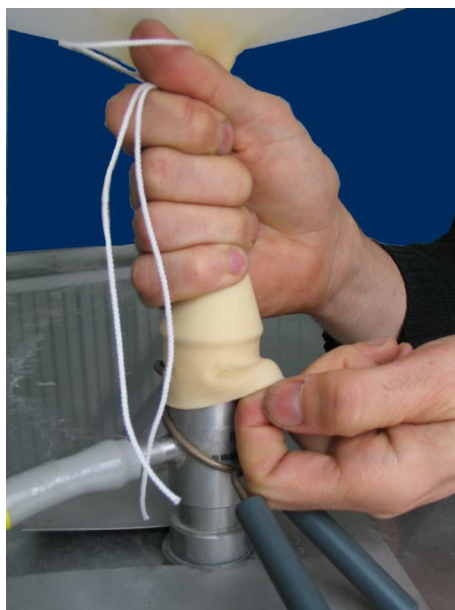


**Figure 5      Balloon Raises the Gas Nozzle**

5. Secure the neck of the balloon tightly with a string and remove the balloon from the gas nozzle.



**Figure 6**      **Securing the Neck of the Balloon**



**Figure 7**      **Removing the Balloon from the Gas Nozzle**

6. Fold the neck of the balloon over and secure firmly. Tie the string high enough to ensure that the unwinder fits easily.



**Figure 8      Folding the Neck of the Balloon**

7. Leave the balloon waiting in the balloon filling shed while you prepare the radiosonde. Make sure the balloon does not touch anything. Hold the balloon by the neck.

## Optional Sounding Accessories

The Radiosonde RS92 unwinder RSU911 is designed to be attached directly to the folded balloon neck. However, you can use the same unwinder if you use optional sounding accessories such as a parachute or a radar reflector.

Always attach the unwinder to a relatively firm support such as the balloon or the parachute spreader. The support must not let the unwinder twist freely, or otherwise the balloon string might unwind at a too high speed and the radiosonde hit the ground during the launch. The unwinder must also be able to swing slightly during the sounding.

Attach all optional sounding accessories next to the balloon, or otherwise they disturb the measuring environment of the radiosonde and no proper temperature and humidity measurements can be made.

**CAUTION**

The strength of all the strings used during soundings must exceed 25 kp (250 N). Knots in the strings weaken the strength to the minimum of 40 % of the original string strength. This results in a string strength of 10 kp (100 N) which is sufficient for RS92-SGP soundings.

**Table 3      Ordering Codes for Optional Sounding Accessories**

Item	Code	Note
Totex parachute	15046	
Rubber plate	RS46158	Used with a radar reflector
Hanger board	RS46157	Used with a non-Totex parachute

### **Totex Parachute 5710-5**

The recommended parachute is the Totex type 5710-5 (Vaisala code 15046). In the Totex parachute an elastic ribbon loop hangs the unwinder securely under the spreader.

Attach the parachute directly to the balloon with the parachute string. See [Figure 9 on page 21](#) for details. For unwinder attaching instructions, see section [Totex Parachute on page 31](#).

### **Radar Reflector**

When using a radar reflector, it prevents the unwinder from swinging. Therefore, attach the unwinder to the reflector with a rubber plate accessory (Vaisala code RS46158), which lets the unwinder swing, and the balloon string is unwind smoothly.

1. Tie the radar reflector to the balloon with a string of approximately 50 cm in length.
2. Attach the rubber plate (RS46158) to the radar reflector.

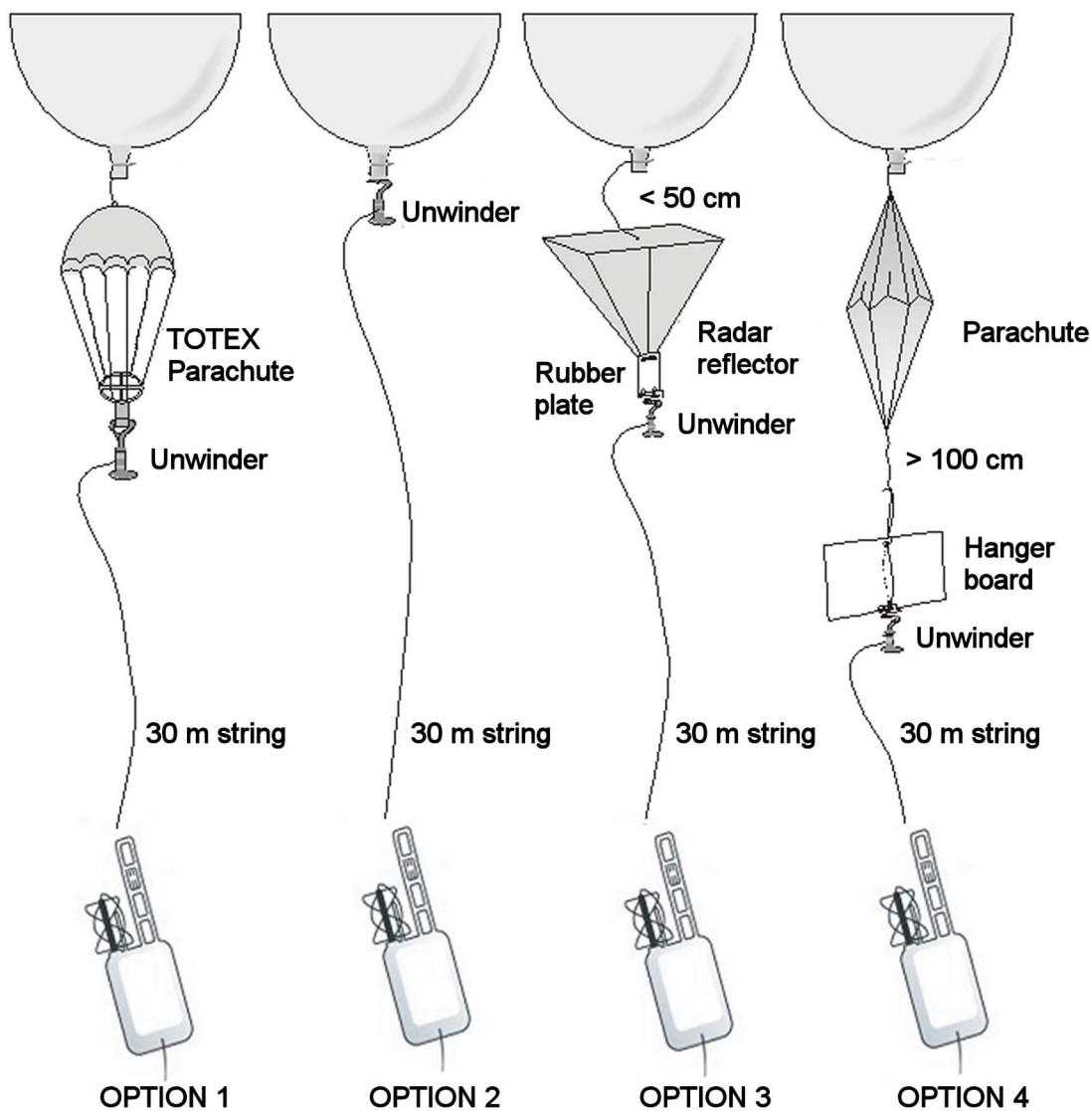
See [Figure 9 on page 21](#) for details. For unwinder attaching instructions, see section [Radar Reflector on page 31](#).

## Non-Totex Parachute

If you are using a parachute that has no firm objects to prevent the unwinder from twisting, you have to use a hanger board (Vaisala code RS46157).

1. Tie the parachute to the balloon with a string.
2. Tie the hanger board to the parachute with a string of approximately 20 cm in length.

See [Figure 9 on page 21](#) for details. For unwinder attaching instructions, see section [Non-Totex Parachute on page 31](#).



**Figure 9 Vaisala Radiosonde Sounding Accessories**

- Option 1 = Sounding with a Totex parachute
- Option 2 = Sounding with no sounding accessories
- Option 3 = Sounding with a radar reflector
- Option 4 = Sounding with a non-Totex Parachute

Now you can proceed to unpack the radiosonde.

## Unpacking the Radiosonde

Follow these steps to unpack the radiosonde.

### CAUTION

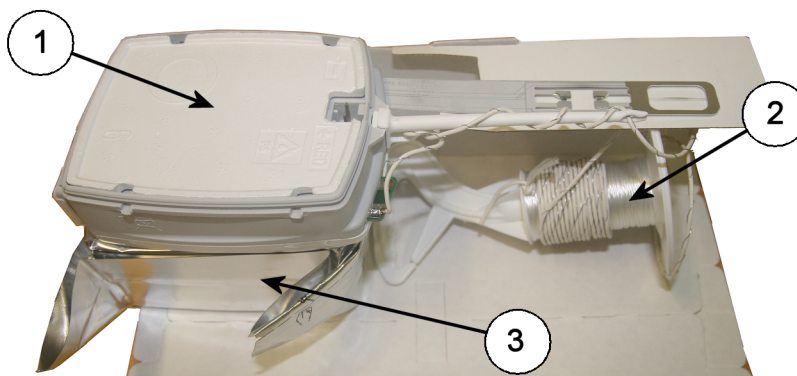
Do not touch or hit the sensors on the sensor boom. By carefully handling the radiosonde and the sensor boom you ensure that the radiosonde functions properly during sounding.

1. Open the foil bag as indicated on the bag.



**Figure 10** Opening the Foil Bag

2. Lift the cardboard flap protecting the sensor boom. Be careful to avoid touching or hitting the sensors on the sensor boom.

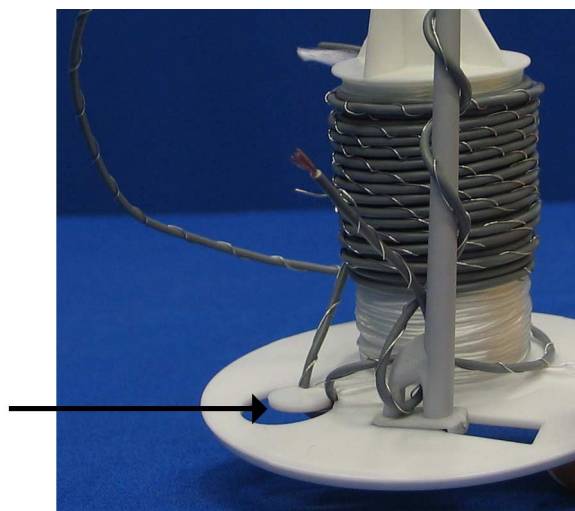


**Figure 11** Contents of the Radiosonde Package

- 1 = Radiosonde
- 2 = Unwinder
- 3 = Battery



3. Remove the radiosonde from the package, free the antenna, and take the unwinder out of the package.
4. Make sure the plastic lip, under which the string runs, is level with the unwinder bottom plate. If the lip is bent, bend it gently back to level the position.



**Figure 12 Unwinder Details**

Proceed to perform the sounding preparations.

## Performing Sounding Preparations

When performing the sounding preparations, the Vaisala Ground Check Set GC25 is connected to the DigiCORA® sounding system via cable and operated with the help of the DigiCORA® sounding software.

### **NOTE**

If you are using DigiCORA® Sounding System MW21, software version < 3.12, or MW15, MW12 or MW11, software version < 8.311, refer to the Ground Check Set GC25 User's Guide for information on using the GC25 in the stand-alone mode.



**Figure 13 Vaisala Ground Check Set GC25**

- 1 = Chamber
- 2 = Display
- 3 = Buttons
- 4 = Communication cable
- 5 = Radiosonde tray
- 6 = Power switch

Follow these steps to perform the sounding preparations.

1. Open the chamber of the Ground Check Set and place the radiosonde onto the radiosonde tray. Close the chamber.
2. Connect the communication cable to the Ground Check Set interface in the radiosonde. Text "UP" on the connector faces upwards.



**Figure 14 Radiosonde in the GC25 with the Communication Cable Connected**

3. Switch on the PC and start a new sounding with the DigiCORA® sounding software. For detailed instructions on using the software, refer to the DigiCORA® User's Guide.
4. Switch on the Ground Check Set by pressing the power switch. The green LED in the power switch is lit.
5. If needed, tune the radiosonde frequency.

The radiosonde is tuned at the factory to the default frequency of 403 MHz. You can adjust it within the 400.15 to 406 MHz band with the tuning potentiometer provided with the Ground Check Set GC25. The hole for frequency tuning, covered by tape, is located in the upper left corner of the radiosonde.

**NOTE**

The tuning potentiometer has to be a ceramic Phillips head trimmer. It is included in the Ground Check Set delivery. If you do not have a proper tuning potentiometer, you can order it from Vaisala (order code 214513).

- Partially detach the tape so that only the frequency tuning hole is revealed. Leave the other end of the tape attached to the radiosonde.
  - Wait until the sounding software is in Track mode (display shows 40x.xx Hz Trck...).
  - Turn the tuning screw clockwise with the potentiometer to lower the frequency and counterclockwise to increase the frequency. Adjust the frequency carefully, staying between 400.4 ... 405.6 MHz. These limits ensure that the transmitter does not drift outside the available band of 400.15 ... 406 MHz. You can see the frequency changing in the sounding software when you turn the screw.
  - Re-attach the tape to cover the tuning hole. The tuning hole has to be covered during sounding to prevent water from penetrating into the radiosonde electronics.
6. The DigiCORA® sounding software goes through reconditioning, timer setting, and ground checking. Set the timer when the ground equipment prompts for it. Add an average of 30 minutes to the targeted sounding or transmission time.

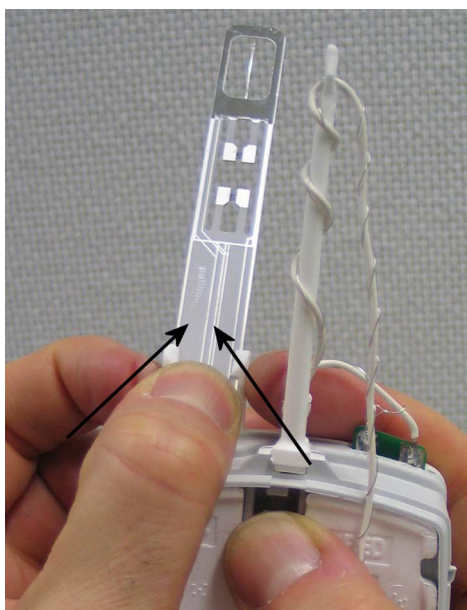
**NOTE**

The timer countdown is different for analog (RS92-K and RS92-KL) and digital radiosondes (for example, RS92-SGP): For analog radiosondes, the timer countdown starts on the ground, beginning when the radiosonde is connected to the Ground Check Set. Therefore, you have to add some extra time to the timer to be able to activate and connect the battery and launch the radiosonde. For digital radiosondes, the timer countdown starts from launch detect, and, therefore, no extra time is required.

7. When the DigiCORA® sounding software is finished, the message "Ready for sonde release" appears on the display. Remove the radiosonde from the Ground Check Set and disconnect the communication cable.
8. The back of the radiosonde facing you, press the sensor boom gently forward with your thumbs until the plastic clips on both sides click and the sensor boom sits firmly in the bended position.

**CAUTION**

Only touch the bottom of the boom. Do not touch or hit the sensors.



**Figure 15** Placing the Sensor Boom into Flight Position

The sensor boom is now in the flight position and remains so throughout the sounding.

Now proceed to connect the radiosonde battery.

## Connecting the Battery

### General

The RS92-K and RS92-KL are powered by the RSB931 Water-activated Battery.



**Figure 16**      **Water-activated Battery**

## Connecting the Water-activated Battery

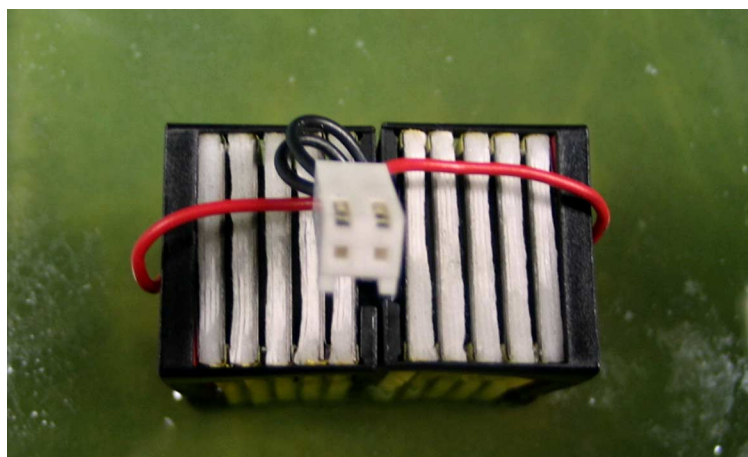
Follow these steps to connect the water-activated battery:

1. Open the foil bag as indicated on the bag.



**Figure 17 Battery Package for Water-Activated Battery**

2. Take the battery out of its casing.
3. Place the battery in a water container with the connectors facing upwards and immerse in water for four minutes. Use fresh tap water, with a temperature of 15...25 °C.



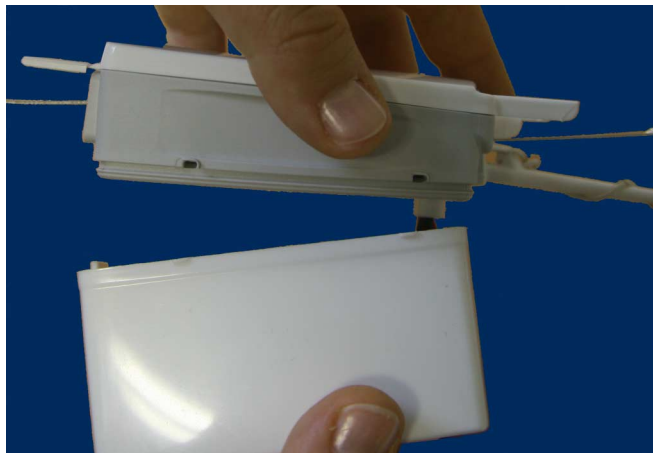
**Figure 18 Battery Immersed in Water**

4. Take the battery out of the water after four minutes of immersion. Do not squeeze water out of the battery.
5. Put the battery back into the casing. One end of the battery is waxed to prevent leakage. The waxed end should point downwards.



**Figure 19 Battery in the Casing**

6. Connect the battery connector to the radiosonde.



**Figure 20 Connecting the Battery Connector to the Radiosonde**

7. The radiosonde has now been activated. Close the battery casing.

8. Check from the DigiCORA® sounding software that the telemetry link is working well. For detailed instructions on using the sounding software, refer to the DigiCORA® User's Guide.

The radiosonde is now prepared for launch. In order to ensure 120 minutes of flight time, the radiosonde has to be launched within 15 minutes of battery connection.

Proceed now to launch the radiosonde.

## Launching the Radiosonde

The radiosonde is now ready for launch.

## Attaching the Unwinder

The unwinder is used to unwind the suspension string gently and slowly. To do this, the unwinder must be attached firmly so that it does not rotate relative to the balloon. If the unwinder moves freely, the suspension string unwinds too quickly, and it is possible that the radiosonde hits the ground upon launch.

The unwinder is designed to be tied directly to the balloon.

If you cannot attach the unwinder directly to the balloon, for example when using a radar reflector or a parachute, sounding accessories are needed to restrict the movement of the unwinder. For instructions, refer to section [Optional Sounding Accessories on page 18](#).

### Attaching the Unwinder to the Balloon

Follow these steps to attach the unwinder directly to the balloon:

1. Pass the unwinder hook through the loop created by the tied balloon neck.



2. Make sure that the hook comes out the other side as shown in [Figure 21 on page 31](#). The unwinder is now attached firmly to the balloon.



**Figure 21 Attaching the Unwinder to the Balloon**

If you use optional sounding accessories, follow these instructions to attach the unwinder.

### **Totex Parachute**

The Totex parachute 5710-5 has an elastic ribbon loop below the spreader. Attach the unwinder to the loop by pushing the hook out the other side in the same fashion as with the folded balloon neck (see [Attaching the Unwinder to the Balloon on page 31](#)).

### **Radar Reflector**

There is a rubber plate attached to the radar reflector. Attach the unwinder to this plate.

### **Non-Totex Parachute**

There is a hanger board tied to the parachute. Attach the unwinder to the bottom of the hanger board.

## Releasing the Balloon

In order to ensure 120 minutes of flight time, the radiosonde should be launched within 15 minutes of battery connection.

Follow these steps to release the balloon:

1. Make sure the balloon string is not tangled.
2. Hold the unwinder to prevent the string from running out before the release.
3. Release the balloon and allow the radiosonde to lift from your hand. Keep the string length between the radiosonde and the unwinder as short as possible.

## Checking the Reception

Immediately after the release, check the reception of the radiosonde frequency on the receiver.

Proceed to monitor the sounding with the DigiCORA® Sounding System.

## Monitoring the Sounding with the DigiCORA® Sounding System

If you have not already done so, enter the surface observation information in the DigiCORA® Sounding System. Please refer to the DigiCORA® User's Guide for detailed instructions on using the sounding software.

## CHAPTER 4

# STORAGE AND TRANSPORTATION

This chapter provides information for the transport and storage of the product.

## Storage

Radiosondes must be stored and used properly in accordance with applicable instructions, the User's Manual, and specifications issued by Vaisala.

Proper storage conditions must fulfill the following requirements:

Radiosondes must be kept in their original packaging (unopened vacuum envelopes) in a dry, ventilated indoor storage space, and within the following key environmental limits (ref. IEC 60721-3-1 class 1K2):

- Temperature +5 °C to +40 °C
- Relative humidity below 85%

Vaisala AUTOSONDE storage compartment requirements are:

- The maximum number of days a radiosonde can be loaded in AUTOSONDE is 14
- Relative humidity below 50%
- Temperature +15 °C to +35 °C

**CAUTION**

The radiosonde string is not resistant to prolonged exposure to sunlight. Store radiosondes in their original unopened vacuum envelopes.

## Transportation

Vaisala radiosondes must be transported in their original shipping packaging. These packages are designed and built to survive and protect their contents in the environmental conditions described herein with the terminology and standards per standard: IEC 60721-3-2. The transportation of radiosondes requires climatic conditions 2K2 and mechanical conditions 2M1 of this standard:

- Transportation in weather protected conditions.
- Transportation using conventional means (car, truck, and/or aircraft), with free fall not exceeding 0.25 m in any circumstance.
- Following additional markings on packaging.

## CHAPTER 5

# FAILURE REPORT AND WARRANTY

This chapter presents information about the failure report and radiosonde warranty.

## Failure Report

In case of some malfunction, write a failure report consisting of the following issues:

- What failed (what worked / did not work)?
- Where did it fail (location and environment)?
- When did it fail (date, immediately / after a while / periodically / randomly)?
- How many failed (only one defect / other same or similar defects / several failures in one unit)?
- What was connected to the product and to which connectors?
- What was done when the failure was noticed?

Include the radiosonde serial number in the failure report.

## Technical Support

For technical questions, contact the Vaisala technical support:

E-mail [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com)

Fax +358 9 8949 2790

If the product needs repair, please follow the instructions below to speed up the process and to avoid extra costs to you.

1. Read the warranty information.
2. Contact Vaisala technical support via e-mail or fax and request for RMA (Return Material Authorization) and shipping instructions.
3. Proceed as instructed by Vaisala technical support.

**NOTE**

RMA must always be requested from Vaisala technical support before returning any faulty material.

## Radiosonde Warranty

The following Vaisala Radiosonde general warranty statement is effective as of 02/2007. However, please refer to the applicable supply contract for the specifics of your warranty terms. If there is a discrepancy between the general radiosonde warranty statement and the radiosonde warranty statement in the supply contract, the provisions of the official radiosonde warranty statement in the supply contract prevail.

### Vaisala Radiosonde Warranty Statement

Vaisala repairs or, at its discretion, replaces any Vaisala RS92 radiosonde that is proven, with reasonable satisfaction, to have failed within 13 months of shipment by reason of faulty materials or workmanship, under the following conditions and provided that radiosonde is stored and used properly in accordance with applicable instructions and manuals issued by Vaisala.

## Storage Conditions

Radiosonde shall be stored indoors in its original unopened vacuum envelope within the following environmental limits:

- temperature +5 °C to +40 °C
- relative humidity below 85%

Additional storage requirements for Vaisala AUTOSONDE:

- the maximum number of days radiosonde can be loaded in AUTOSONDE is 14
- relative humidity below 50%
- temperature +15 °C to +35 °C

## Transportation and Handling

Radiosondes shall be transported in the original shipping packaging, which is designed and built to survive and protect the contents in the environmental conditions specified in standard IEC 60721-3-2: climatic conditions of class 2K2, and mechanical conditions of class 2M1 of the standard are required. Instructions on the packaging for transportation and handling shall be followed.

## Criteria for Radiosonde Failures

Pre-flight failures under warranty:

- Radiosonde fails during the sounding preparation, or ground check correction exceeds one of the following limits:

P:  $\pm 3$  hPa

T:  $\pm 1$  °C

U:  $\pm 4\%$  RH (at 0% RH)

In-flight failures below altitude of 100 hPa under warranty:

- Radiosonde stops transmitting one or more parameters
- Radiosonde transmits clearly erroneous data
- There is a continuous telemetry link failure exceeding 2 minutes

Early termination of sounding caused by balloon burst, user error, or any external cause, is not covered by this warranty.

## **Making Warranty Claims**

A failure report shall be provided for each failed radiosonde stating the radiosonde serial number, a description of the failure, and sounding site and date. A template provided by Vaisala can be used for this.

A radiosonde found defect prior to launch shall be returned to the nearest Vaisala office.

Report of an in-flight failure shall be accompanied by either 1) sounding data file (MW21, MW31 and AUTOSONDE systems) or 2) sounding status report printout (MW11/MW12/MW15 systems) for each failed sounding.

Failure report and any radiosonde failed prior to launch shall be sent to Vaisala within 180 days after the failure, or within a year from extremely remote or shipborne stations.



## APPENDIX A

# **SAFETY INSTRUCTIONS FOR BALLOON OPERATORS**

This appendix contains details of safe and proper balloon preparation.

Photocopy these instructions and place the list in clear view in the balloon filling shed and in the sounding compartment.

1. No smoking or naked flame allowed.
2. If possible, avoid wearing clothing made of nylon or other synthetic fibers to prevent a build-up of static charges. Do not wear shoes with rubber soles.
3. Wear protective glasses.
4. Regularly check that the gas tube fits securely to the gas cylinder or generator nozzle and to the balloon inflation nozzle.
5. Take care to prevent a gas leak in the shed when interrupting inflation to replace a gas cylinder.
6. Never use a repaired balloon.
7. Should a leak develop in the balloon during inflation, do not let gas escape from the balloon inside the shed if possible. Instead, release the defective balloon without load. It is not advisable to deflate the balloon, even outside the shed.
8. Do not touch the balloon with bare hands except when holding it by the neck. Wear soft cotton gloves.
9. Ensure that there are no pointed objects in the shed. Nails, hooks, hinges, padlocks, etc., are dangerous as they might scratch the inflated balloon. The balloon film is only 0.05 ... 0.1 mm thick upon launch; the slightest scratch could cause the balloon to burst prematurely.
10. Keep the doors of the shed shut while inflating the balloon on a windy day. However, ensure that the shed is properly ventilated.
11. No unauthorized person shall be allowed admittance to the shed while the hydrogen generator is in operation or balloon inflation is going on.
12. Ensure that all tools and other implements not essential for balloon inflation have been removed from the shed.

**WARNING**

New operator! Carefully study the instructions for using the hydrogen generator and for the correct method of inflation.

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