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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 Vaisala Radiosonde RS92-AM.

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

<table>
<thead>
<tr>
<th>Manual Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>M210696EN-D</td>
<td>February 2015. Removed information on rubber plate (RS46158). Updated information on radiosonde unwinder.</td>
</tr>
<tr>
<td>M210696EN-C</td>
<td>Previous version. October 2010. Updated to include MW32 Sounding System and RSB611 Lithium Battery. Template updates.</td>
</tr>
<tr>
<td>M210696EN-B</td>
<td>Previous version.</td>
</tr>
</tbody>
</table>

Related Manuals

Table 2 Related Manuals

<table>
<thead>
<tr>
<th>Manual Code</th>
<th>Manual Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>M210329EN</td>
<td>Ground Check Set GC25 User’s Guide</td>
</tr>
<tr>
<td>M210488EN</td>
<td>Vaisala DigiCORA User’s Guide</td>
</tr>
<tr>
<td>M210372EN</td>
<td>MMS-P Systems with MW22 MARWIN III</td>
</tr>
<tr>
<td>M211069EN</td>
<td>Vaisala MARWIN Sounding System MW32 User’s Guide</td>
</tr>
<tr>
<td>-</td>
<td>Vaisala DigiCORA Sounding System MW41 Online Help, available in the web user interface</td>
</tr>
</tbody>
</table>

Documentation Conventions

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.
## Product-Related Safety Precautions

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
<th>Conduct soundings in a safe environment and in accordance with all applicable restrictions and regulations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARNING</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>WARNING</strong></td>
<td>Do not use the radiosonde without consultation and cooperation with local and other applicable aviation authorities.</td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>Do not modify the unit. Improper modification can damage the product or lead to malfunction.</td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>Do not use the radiosonde for any purpose other than for soundings.</td>
</tr>
</tbody>
</table>
Lithium Battery-Related Precautions

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not place the lithium battery in fire or apply heat to the battery.</td>
</tr>
<tr>
<td>Do not pierce the battery with nails, strike the battery with a hammer, step on the battery, or otherwise damage the outer casing.</td>
</tr>
<tr>
<td>Do not subject the battery pack to strong impacts or shocks.</td>
</tr>
<tr>
<td>Do not expose the battery to water or salt water, or allow the battery to get wet.</td>
</tr>
<tr>
<td>Do not disassemble or modify the battery. The battery contains safety and protection devices which, if damaged, may cause the battery to generate heat, rupture or ignite.</td>
</tr>
<tr>
<td>Do not leave the battery in direct sunlight, or use or store the battery inside cars in hot weather. Doing so may cause the battery to generate heat, rupture, or ignite. Using the battery in this manner may also result in shortened life expectancy and loss of performance.</td>
</tr>
<tr>
<td>Never short circuit, reverse polarity, disassemble, damage, or heat the battery over 100 °C (212 °F). If an exposed lithium battery does not start on fire, it will burn even more violently if it comes into contact with water or even moisture in the air.</td>
</tr>
<tr>
<td><strong>DO NOT THROW WATER ON A BURNING BATTERY.</strong> A fire extinguisher must be used.</td>
</tr>
</tbody>
</table>

Recycling

Recycle all applicable material.

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

DigiCORA® and MARWIN® are registered trademarks of Vaisala Oyj.
CHAPTER 2
PRODUCT OVERVIEW

This chapter introduces the features and advantages of the radiosonde.

Introduction to Vaisala Radiosonde RS92-AM

Vaisala Radiosonde RS92-AM offers improved data availability and improved accuracy in humidity, pressure, and temperature measurement.

This radiosonde type features P(Y)-codeless GPS windfinding, a silicon pressure sensor, a heated twin humidity sensor, and a small, fast temperature sensor. RS92-AM also features easy additional sensor capability. The synthesizer-based transmitter is stable and uses a narrow bandwidth. RS92-AM is compliant with the European ETSI standard for digital radiosondes operating in the 400 MHz band, EN 302 054.
Vaisala Radiosonde RS92-AM can be used with DigiCORA MW41, MW31 and MARWIN MW32 Sounding Systems. With MW41 and MW31, the radiosonde needs an optional P(Y) codeless wind finding software.

Figure 1  Vaisala Radiosonde RS92-AM

1 = GPS antenna
2 = Battery case
3 = Additional sensor interface connector
4 = Antenna
5 = Temperature sensor
6 = Humidity sensors
7 = Sensor boom
8 = GC25 interface
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 sections below and refer to Appendix A on page 41 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. Prepare the sounding.
4. Connect the battery.
5. Launch the radiosonde.
6. Monitor the sounding with the sounding system.

NOTE
RS92-AM should not be closer than a distance of 1.5 meters to another radiosonde. This requirement should be be kept in mind especially when performing dual soundings.
Preparing the Balloon and Optional Sounding Accessories

The balloon and the 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.

Preparing the Balloon

**WARNING**

It is recommended that the balloon be prepared in a balloon filling shed. The balloon filling shed must be well ventilated so that possible gas leaks do not remain inside the shed, even in situations when there is no electricity.

**CAUTION**

When handling the balloon, use protective gloves to avoid damaging the balloon surface. Even minor grease stains can damage the balloon, causing premature balloon burst.

Open the balloon package carefully. To avoid damaging the balloon, do not use a knife or other sharp objects to open the package.

Check visually that the balloon is structurally sound and has no perforations or other apparent defects in the nozzle section.
Follow these steps to prepare the balloon:

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

   ![Figure 2](image1)
   **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](image2)
   **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](image)

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](image)
5. Secure the neck of the balloon tightly with a string before removing the balloon from the gas nozzle.

![Figure 6](image1.png)  Securing the Neck of the Balloon

![Figure 7](image2.png)  Removing the Balloon from the Gas Nozzle
6. Fold the neck of the balloon over and secure it firmly. Cut off any extra string. Make sure that the unwinder fits and is firmly attached in the folded balloon neck.

![Figure 8 Balloon Neck Tied Firmly](image)

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.

<table>
<thead>
<tr>
<th>NOTE</th>
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</thead>
<tbody>
<tr>
<td>When using a balloon with an integrated parachute, make sure that a sufficiently long piece of the parachute string is poking out of the balloon neck in order to fasten the string to the radiosonde unwinder.</td>
</tr>
</tbody>
</table>

## Preparing Optional Sounding Accessories

The 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.

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 suspension string might unwind at too high a 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.
The recommended parachute is the Totex type 5710-5 (Vaisala code 15045). 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.

**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 22 for details.
Figure 9  Vaisala Radiosonde RS92 Sounding Accessories

Option 1  =  Sounding with a Totex parachute
Option 2  =  Sounding with no sounding accessories
Option 3  =  Sounding with a non-Totex Parachute
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 and is attached firmly, as shown in Figure 10 on page 23.

If you are using a balloon with an integrated parachute, fasten the parachute string poking out of the balloon neck to the unwinder.

Figure 10   Unwinder Attached to the Balloon Neck
Unpacking the Radiosonde

Follow these steps to unpack the radiosonde:

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

![Opening the Foil Bag](image)

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

3. Remove the radiosonde from the package, free the antenna, and take the unwinder out of the package.

4. Remove the small plastic rubber wire from the unwinder.

![Unwinder Details](image)

5. Make sure the plastic lip under which the string runs is level with the unwinder bottom plate. If the lip is bent upwards, bend it gently back to level position. See Figure 13 on page 25.
Preparing the Sounding

When preparing the sounding, Vaisala Ground Check Set GC25 is connected to the sounding system via cable and operated with the help of the sounding software. Alternatively, the RS92-AM can be connected to the PC via radiosonde cable.

**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 14  Vaisala Ground Check Set GC25

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

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.

3. Switch on the PC and start a new sounding with the sounding software. For detailed instructions on using the software, refer to the appropriate sounding system documentation.

4. Switch on the ground check set by pressing the power switch. The green LED in the power switch is lit.

5. When the sounding software is finished, a message appears on the display. Remove the radiosonde from the ground check set and disconnect the communication cable.

6. The back of the radiosonde facing you, press the sensor boom gently forward with your thumbs until the plastic clips on both
sides click (you may have to spread the plastic clips slightly) and the sensor boom sits firmly in the bent 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](image)

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

General

The RS92-AM is powered by RSB611 Lithium Battery, see Figure 16 on page 28 for an example.

Figure 16  RSB611 Lithium Battery
Connecting the Battery

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

![Battery Package](image1)

**Figure 17** Battery Package

2. Take out the battery connector (number 1 in **Figure 18 on page 29**) by gently pulling the wires.

![Battery Connector Shown with RSB611](image2)

**Figure 18** Battery Connector Shown with RSB611
3. Connect the battery connector to the radiosonde.

![Figure 19](image)

*Figure 19   Connecting the Battery Connector to the Radiosonde*

4. The radiosonde has now been activated. Close the battery case.

5. Check from the sounding system software that the telemetry link is working well. For detailed instructions on using the sounding software, refer to the sounding system user manuals.

The radiosonde is now prepared for launch. In order to ensure 120 minutes of flight time, it is recommended that the radiosonde is launched within 15 minutes of battery connection.
Removing the Battery Case

If you need to remove the battery case from the radiosonde, use, for example, a small coin to loosen the battery case. Push the coin into the small opening between the radiosonde and the battery case to loosen the case and remove it. See Figure 20 on page 31.

![Removing the Battery Case](image)

Launching the Radiosonde

The radiosonde is now ready for launch.

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 suspension 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 sounding system.

**Monitoring the Sounding with the Sounding System**

If you have not already done so, enter the surface observation information in the sounding system. Please refer to the sounding system user manuals 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 Guide, 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
Transportation

Vaisala radiosondes must be transported in their original shipping packages. 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 circumstances.
- Following additional markings on packaging.

Do not transport the radiosonde with the battery connected.

Transporting Lithium Batteries and RS92 Radiosondes

RSB611 lithium batteries and RS92 radiosondes with lithium batteries are classified as:

- UN 3090 Lithium metal batteries
- UN 3091 Lithium metal batteries contained in equipment

Consignments must be packed, labeled, and documented according to the IATA packing instructions.

When transporting the radiosondes with lithium batteries, take the following requirements into account:

- The package must display a lithium battery handling label, see Figure 21 on page 35 for an example. The original radiosonde shipping should be used for transport, and it already has the lithium battery handling label.

CAUTION
The suspension string is not resistant to prolonged exposure to sunlight. Store the radiosondes in their original unopened vacuum envelopes.
- The consignment must include a document indicating the lithium content, describing proper handling and procedures for damaged packages, and a telephone number for additional information. The original radiosonde consignment includes a SHIPPER’S DECLARATION FOR ARTICLES NOT REGULATED AS DANGEROUS GOODS, which should be reused for this purpose after updating the appropriate information.

![Lithium Battery Handling Label](image)

**Figure 21** Lithium Battery Handling Label

**NOTE** If the lithium battery is faulty, do not transport it.
CHAPTER 5

FAILURE REPORT AND WARRANTY

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

Technical Support

For technical questions, contact the Vaisala technical support by e-mail at helpdesk@vaisala.com. Provide at least the following supporting information:

- Name and model of the product in question
- Serial number of the product
- Name and location of the installation site
- Name and contact information of a technically competent person who can provide further information on the problem

Product Returns

If the product must be returned for service, see www.vaisala.com/services/return.html. For contact information of Vaisala Service Centers, see www.vaisala.com/services/servicecenters.html.
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: ± 3 hPa
  
T: ± 1 °C
  
U: ± 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.

13. Do not take any electrical devices (cell phone etc.) to the balloon filling shed or close to the balloon inflated with hydrogen. Safe distance when outdoors is typically 1.5 meters.

14. Always keep the radiosonde at least 50 cm below the level of the gas nozzle and the inflated balloon, and at least 1.5 meters away from the gas cylinder/hydrogen generator, connectors, and tubing. Avoid taking the radiosonde inside the balloon filling shed, if possible.

15. Follow all regulations concerning hydrogen safety.

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