USER'S GUIDE

Vaisala Radiosonde
RS41-SG
# Table of Contents

## CHAPTER 1
**GENERAL INFORMATION** .......................................................... 7  
  About This Manual ................................................................. 7  
  Contents of This Manual ...................................................... 7  
  Version Information ........................................................... 8  
  Related Manuals ..................................................................... 8  
  Documentation Conventions .................................................. 8  
  Product-Related Safety Precautions ........................................ 9  
    ESD Protection ..................................................................... 9  
    Lithium Battery-Related Precautions .................................... 10  
  Recycling .................................................................................. 11  
  Regulatory Compliances ......................................................... 11  
  Trademarks ............................................................................... 11

## CHAPTER 2
**PRODUCT OVERVIEW** ............................................................... 13  
  Introduction to Vaisala Radiosonde RS41-SG ......................... 13  
  RS41 Unwinder ........................................................................ 14

## CHAPTER 3
**OPERATION** ............................................................................ 17  
  General .................................................................................... 17  
  Preparing the Sounding with Ground Check Device RI41 .......... 18  
  Checking RS41 LED Light ....................................................... 21  
  Preparing RS41 Unwinder ....................................................... 22

## CHAPTER 4
**STORAGE AND TRANSPORTATION** ......................................... 27  
  Storage .................................................................................... 27  
  Transportation .......................................................................... 28

## CHAPTER 5
**TECHNICAL SUPPORT** ............................................................ 31  
  Product Returns ....................................................................... 31  
  Technical Support ..................................................................... 31

## APPENDIX A
**REPLACING RADIOSONDE BATTERIES** ...................................... 33
List of Tables

Table 1  Manual Versions ......................................................... 8
Table 2  Related Manuals ..................................................... 8
Table 3  Unwinder Properties ................................................... 14
Table 4  RS41 LED Lights ...................................................... 21
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Vaisala Radiosonde RS41-SG with Unwinder</td>
<td>15</td>
</tr>
<tr>
<td>Figure 2</td>
<td>RS41 Unwinder</td>
<td>16</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Ground Check Device RI41</td>
<td>18</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Do Not Touch the Radiosonde Sensors</td>
<td>19</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Radiosonde RS41 Placed on RI41</td>
<td>19</td>
</tr>
<tr>
<td>Figure 6</td>
<td>RS41 Unwinder</td>
<td>22</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Unwinder Stick Attached to the Unwinder Bottom Plate</td>
<td>23</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Pushing the Unwinder to Place</td>
<td>24</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Unwinder Stick Locking into Place</td>
<td>24</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Lithium Battery Handling Label</td>
<td>29</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Do Not Touch the Radiosonde Sensors</td>
<td>34</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Opening the Radiosonde Cover</td>
<td>34</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Opening the Snap Locks</td>
<td>35</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Opening the Radiosonde Cover</td>
<td>35</td>
</tr>
<tr>
<td>Figure 15</td>
<td>RS41 Batteries in the Battery Holder</td>
<td>36</td>
</tr>
<tr>
<td>Figure 16</td>
<td>RS41 Battery Holder Polarity Symbols</td>
<td>37</td>
</tr>
<tr>
<td>Figure 17</td>
<td>RS41 Battery Holder Spring Clip</td>
<td>38</td>
</tr>
<tr>
<td>Figure 18</td>
<td>Placing Radiosonde Sensor Boom</td>
<td>39</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Replacing Radiosonde Cover</td>
<td>39</td>
</tr>
<tr>
<td>Figure 20</td>
<td>Snapping Radiosonde Covers Together</td>
<td>40</td>
</tr>
</tbody>
</table>
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 RS41-SG. For information on preparing the balloon and optional sounding accessories, see Vaisala Guide to Sounding Preparations, Technical Reference. For information on sounding software MW41, see the on-line help, embedded in the sounding software.

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, Technical Support: This chapter presents information about the failure report and radiosonde warranty.
- Appendix A, Replacing Radiosonde Batteries: This appendix provides information on replacing radiosonde batteries.

**Version Information**

Table 1  Manual Versions

<table>
<thead>
<tr>
<th>Manual Code</th>
<th>Description</th>
</tr>
</thead>
</table>

**Related Manuals**

Table 2  Related Manuals

<table>
<thead>
<tr>
<th>Manual Code</th>
<th>Manual Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>M211367EN</td>
<td>Vaisala Guide to Sounding Preparations Technical Reference</td>
</tr>
<tr>
<td>M211429EN</td>
<td>Vaisala DigiCORA Sounding System MW41 Getting Started Guide</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

**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.

**ESD Protection**

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. It is possible to damage the product, however, by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

- Handle ESD sensitive components on a properly grounded and protected ESD workbench.
- When an ESD workbench is not available, ground yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either of the above precautions, touch a conductive part of the equipment chassis with your other hand before touching ESD sensitive components.

- Always hold component boards by the edges and avoid touching the component contacts.

### 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.

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

Regulatory Compliances

Vaisala Radiosonde RS41-SG complies with the following performance and environmental test standards:

- 2004/108/EC Electromagnetic Compliance:
  EN 61000-4-2, EN 61000-4-3 and EN 55022 / EN 302 054-2
- ERM Electromagnetic Compatibility and Radio Spectrum Matters:
  ETSI EN 302054-1 and ETSI EN 302054-2
- RoHS compliance:
  RoHS Directive (2011/65/EC)

Trademarks

DigiCORA® is a registered trademark of Vaisala Oyj.
CHAPTER 2
PRODUCT OVERVIEW

This chapter introduces the features and advantages of the radiosonde.

Introduction to Vaisala Radiosonde RS41-SG

Vaisala Radiosonde RS41-SG offers excellent data availability and accuracy of humidity, temperature, pressure, and wind measurement. The radiosonde is fast and stable with individual, SI-standard traceable calibration.

Vaisala Radiosonde RS41 temperature sensor utilizes linear resistive platinum technology. The small size of the sensor results in low solar radiation error and guarantees fast response. Wind data, height and pressure are derived from Vaisala Radiosonde RS41-SG GPS data combined with differential corrected GPS data from MW41 ground station.

Robust design, Physical Zero Humidity Check and In-built Functional Temperature Check ensure reliable performance in every situation. The radiosonde is also easy to use. For example, there is no need for the user to connect the batteries to the radiosonde to activate it. The radiosonde is automatically activated when placed on Ground Check Device RI41 or GC41. To make it easier to check the status of the radiosonde, Radiosonde RS41-SG has LED light indicators visible on the cover. See Figure 1 on page 15 for an illustration of RS41 with unwinder.
**RS41 Unwinder**

The unwinder is specifically designed for use with Radiosonde RS41. The unwinder is installed to the radiosonde so that it bends the sensor boom to the correct sounding position, ensuring repeatable results in the soundings. See Figure 2 on page 16 for an illustration of the unwinder.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Unwinder Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material of the string</td>
<td>Non-UV treated polypropylene</td>
</tr>
<tr>
<td>Tenacity</td>
<td>&lt;115 N</td>
</tr>
<tr>
<td>Length of the string</td>
<td>30 m</td>
</tr>
<tr>
<td>Unwinder weight with stick</td>
<td>24 g</td>
</tr>
</tbody>
</table>

The unwinders are shipped in the radiosonde package, packed separately from the radiosondes. This allows the operator to prepare the balloon with the unwinder and the stick attached to it at a time that is most convenient. The unwinder is connected to the radiosonde by attaching the stick to its place and, while it is being attached, the stick bends the sensor boom to the sounding position.
Figure 1   Vaisala Radiosonde RS41-SG with Unwinder

1 = Sensor boom
2 = Power switch
3 = Additional sensor interface connector
4 = Antenna
5 = LED light
6 = Unwinder
7 = Unwinder stick
Figure 2  RS41 Unwinder
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.

The workorder for a sounding is as follows:

1. Unpack and prepare the balloon, the unwinder and the optional sounding accessories.
2. Unpack and prepare the radiosonde with the ground check device.
3. Attach the unwinder to the radiosonde.
4. Launch the radiosonde.
5. Monitor the sounding with the sounding system.

The following sections include information on preparing the radiosonde for the sounding with Ground Check Device RI41. For detailed information on other sounding preparation phases, such as preparing the optional sounding accessories, see Vaisala Guide to Sounding Preparations, Technical Reference. For information on configuring the sounding system software, see Vaisala DigiCORA Sounding System Getting Started Guide and the on-line help.
Preparing the Sounding with Ground Check Device RI41

In the sounding preparations, RI41 is connected to the sounding workstation PC via a USB cable and operated with the help of the sounding software. RI41 is switched on by connecting it to the sounding system and turning on the sounding workstation PC.

For information on configuring RI41 as the ground check option in the sounding software, see the MW41 on-line help. The on-line help also provides information on other options for preparing the radiosonde for the sounding.

Figure 3  Ground Check Device RI41
Follow the steps below to prepare the radiosonde for a sounding with RI41:

1. Place the radiosonde on RI41 carefully. Make sure that the radiosonde sensor boom does not hit the support plate on RI as this might damage the sensor boom.
   The radiosonde is automatically switched on when placed on RI41.
2. The sounding software automatically detects the radiosonde and begins the sounding preparations.

The sounding software goes through reconditioning and ground check. The status is clearly indicated with a progress bar. During the ground check, the following preparation steps are performed for the radiosonde:

- T check: The radiosonde performs an in-built functional temperature check.
- Reconditioning: Preparation of humidity sensor.
- Cooling after reconditioning
- U check: The radiosonde performs a physical zero humidity check.

3. After the ground check is finished, the sounding software indicates the results with a message. Remove the radiosonde from RI41.

Before the radiosonde is launched, you can return to the preparation phase anytime by replacing the radiosonde on RI41. The sounding software automatically returns to the ground check phase.

If there is any delay in starting the sounding, for example, if you must wait before launching the sounding balloon, you can switch the radiosonde off by pressing the power switch. When you are ready to launch the balloon, switch the radiosonde back on.

4. After radiosonde launch, proceed to monitor the sounding with the sounding software.
### Checking RS41 LED Light

After preparing radiosonde RS41 for the sounding, check the radiosonde GPS reception by checking the LED light on the radiosonde cover. RS41 LED light will switch off automatically after the launch.

**Table 4 RS41 LED Lights**

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green LED is blinking.</td>
<td>When the green LED light is blinking, the reconditioning of the humidity sensor and sensor checks are in progress and/or GPS signal has not been detected after the radiosonde startup. To receive the GPS signal, take the radiosonde outside with line of sight to GPS satellites.</td>
</tr>
<tr>
<td>Green LED is lit and burns steadily.</td>
<td>1. The radiosonde is ready and works fine, determined by the radiosonde self diagnostics. The self diagnostics cover, for example, temperature and humidity sensors, as well as GPS. 2. GPS satellites are detected. Once GPS signal has been found after radiosonde start up, the LED light becomes steady green. The LED stays steady green despite possible GPS blind spots (for example, inside the balloon shelter), indicating that the GPS feature has been diagnosed to be OK. 3. The steady green LED light indicates that the telemetry from RS41 is working.</td>
</tr>
<tr>
<td>Red LED is lit.</td>
<td>Error. For possible battery replacement, see Appendix A Replacing Radiosonde Batteries on page 33.</td>
</tr>
</tbody>
</table>

**NOTE**

Even though the radiosonde LED light is steady green and the telemetry is working, it does not necessarily indicate that MW41 sounding software receives data from the radiosonde. Always make sure that the sounding software receives the data.
Preparing RS41 Unwinder

To start using the RS41 unwinder, first detach the unwinder stick (number 1 in Figure 6 on page 22) from the unwinder body. The stick is attached between two plastic clips in the unwinder hook (number 2). Detach the stick from between the plastic clips and pull it out from the unwinder bottom plate (3).

If the unwinder stick is tightly attached to the bottom plate, it is a good idea to slightly twist the unwinder stick before pulling it out. When you pull the unwinder stick out, make sure that the string unwinds and that it is not tangled. Also make sure that the string does not unwind too much. See Figure 7 on page 23 for a suggestion of how to keep the string from unwinding too much.

In the unwinder body, the unwinder string runs under a round plastic clip (4) on the bottom plate. This will keep the string attached to the unwinder, and the radiosonde attached to the balloon.

Figure 6    RS41 Unwinder

To prevent the string from getting tangled in the clip, make sure the round plastic clip (number 4) is level with the unwinder bottom plate. If the lip is bent, bend it gently back to level position but be careful not the bend it above the bottom plate.
One way of avoiding the unwinder string from unwinding too much and getting tangled is to attach the unwinder stick to the hole in the bottom plate. See Figure 7 on page 23 for an illustration.

Figure 7  Unwinder Stick Attached to the Unwinder Bottom Plate
Before launching the radiosonde, bend the sensor boom to the correct sounding position using the unwinder stick: push the unwinder stick to its position at the end of the radiosonde. As you push, the unwinder stick pushes the sensor boom to the bent position and the unwinder snap lock clicks into place. Make sure that the unwinder is firmly attached to the radiosonde. See Figure 8 on page 24 and Figure 9 on page 24.

Figure 8  Pushing the Unwinder to Place

Figure 9  Unwinder Stick Locking into Place
If necessary, push the unwinder stick in two places: hold the radiosonde in your left hand and push the stick with your thumb as shown in Figure 9 on page 24. Use your right hand thumb to push the stem of the stick against the edge of the radiosonde.

Make sure that the unwinder string does not unwind too much at this stage. It might get tangled during the preparations.
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%

**CAUTION**  The suspension string is not resistant to prolonged exposure to sunlight. Store the unwinders in their original unopened packages.
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.

Transporting RS41 Radiosondes with Lithium Batteries

RS41 radiosondes with lithium batteries are classified as:

- UN 3091 Lithium metal batteries packed with 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 10 on page 29 for an example. The original radiosonde shipping package must be used for transport, and it already has the lithium battery handling label.

- 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.
Figure 10   Lithium Battery Handling Label

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

TECHNICAL SUPPORT

This chapter presents information about technical support.

Product Returns

If the product is found faulty, please follow the instructions below to speed up the process and to avoid extra costs to you.

1. Read the radiosonde 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 and provide the failure report as requested.

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

Technical Support

For technical questions, contact the Vaisala technical support:
E-mail helpdesk@vaisala.com
Fax +358 9 8949 2790
APPENDIX A

REPLACING RADIOSONDE BATTERIES

This appendix provides information on replacing the radiosonde batteries.

**NOTE**

Note that inserting or replacing radiosonde batteries is not part of the normal operation of the radiosonde. It is only needed in a possible error situation indicated by the radiosonde or the ground equipment.

RS41-SG uses two lithium batteries which have power for approximately five hours.

If the radiosonde LED light indicator is red and MW41 sounding system gives a warning on low battery capacity during the radiosonde ground check, you must replace the radiosonde batteries.

To replace the batteries, follow the steps below. You can use, for example, a small screwdriver to open the radiosonde cover.

**CAUTION**

Do not touch the radiosonde sensors, they are fragile and can be easily contaminated. Handle the radiosonde carefully and do not let the sensors touch anything while changing the batteries.
Figure 11  Do Not Touch the Radiosonde Sensors

1. Loosen the radiosonde cover by placing the tip of the screwdriver to the small slots at the antenna end of the radiosonde and twist the screwdriver carefully. See Figure 12 on page 34 for an example. At the same time, slightly press the sides of the bottom half of the radiosonde to loosen the snap locks. See Figure 13 on page 35.
2. Open the radiosonde cover by lifting the antenna end first and remove the styrofoam case from inside the radiosonde.

3. The battery holder is inside the styrofoam case, on top of a PCB board. To make the changing of batteries easier, you can remove the PCB board and the battery holder from inside the radiosonde bottom cover, but be careful not to touch the Printed Circuit Board (PCB).
CAUTION  Do not touch the PCB board. You might deliver electrostatic discharge and damage the radiosonde.

Figure 15  RS41 Batteries in the Battery Holder

4. Remove the old batteries from the battery holder.
5. Before placing the new batteries, check the battery polarity symbols on the radiosonde battery holder carefully. See Figure 16 on page 37 for an illustration of RS41 battery holder polarity symbols.

**CAUTION**

Make sure to check the battery polarity symbols in the battery holder carefully and to place the new batteries correctly. Placing both battery poles in the wrong direction damages the radiosonde. Placing one battery pole in the wrong direction prevents the radiosonde from working.

![Figure 16: RS41 Battery Holder Polarity Symbols](image-url)
6. When placing the new batteries, it is easier to insert the batteries by first pushing them against the spring clips, circled in Figure 17 on page 38.

![Figure 17 RS41 Battery Holder Spring Clip](image)

7. Put the battery holder and the PCB board back inside the styrofoam bottom case and put the styrofoam cover back on.
8. Put the styrofoam case back inside the radiosonde bottom cover. Check the positioning of the sensor boom: Make sure the small hole at the stem of the sensor boom meets the white pin on the edge of the radiosonde cover. Use your thumb to push the stem of the sensor boom, if necessary, but do not touch the sensors.

![Figure 18 Placing Radiosonde Sensor Boom](image)

9. Replace the radiosonde cover by first attaching the three hooks at the sensor end of the radiosonde and then setting the rest of the cover down.

![Figure 19 Replacing Radiosonde Cover](image)
10. Snap the radiosonde covers together and make sure that the three snap locks on both sides of the radiosonde are locked. Check all the seams to make sure that the radiosonde covers are tightly attached.

![Figure 20 Snapping Radiosonde Covers Together](image)

11. Even after changing the batteries, the radiosonde LED light indicator remains red and the sounding software gives a warning on low battery capacity and a short sounding time. However, if these are the only warnings you get, you can start a sounding after changing the batteries and the radiosonde works as usual.

**NOTE**

The radiosonde LED light indicator remains red and the sounding software gives a warning on low battery capacity after replacing the batteries. However, if these are the only warnings you get, you can start a sounding after changing the batteries.