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USER GUIDE

RS41-SG

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M211667EN-J

User Guide

Vaisala Radiosonde

RS41-SG and RS41-SGP



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PUBLISHED BY

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1. About this document

1.1 Version information

This document provides information for operating Vaisala Radiosonde RS41-SG and RS41-SGP, referred to as RS41 in this manual. For information on the sounding software, see the appropriate sounding system documentation.

In this manual, RS41 refers to Radiosonde RS41-SG and RS41-SGP, unless otherwise mentioned. RI41 refers to both RI41 and RI41-B, unless otherwise mentioned.

Table 1 Manual versions

Manual code	Date	Description
M211667EN-J	February 2025	Added instructions on unpacking the radiosonde and updated the balloon handling instructions.
M211667EN-H	March 2022	Updated with Operating environment information. Added a new parachute type, Totex 280V-17, for soundings with small balloons.
M211667EN-G	May 2018	Updated images for the improved cover version of RS41.

1.2 Related manuals

Table 2 Related manuals

Manual code	Description
DOC231720	*Vaisala RS41 Unwinder Quick Guide*
M211367EN	*Vaisala Guide to Sounding Preparations Technical Reference*
M211429EN	*Vaisala Sounding System MW41 Getting Started Guide*
-	*Vaisala Sounding System MW41 Online Help*, embedded in MW41 sounding software
M212751EN	*MW51 User Guide*

Visit vaisala.com/RS41 to watch short videos on how to use the RS41 unwinder.

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1.3 Documentation conventions



WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions 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.



Highlights important information on using the product.



Gives information for using the product more efficiently.



Lists tools needed to perform the task.



Indicates that you need to take some notes during the task.

1.4 Trademarks

Vaisala® is a registered trademark of Vaisala Oyj.

Vaisala BioTwine™ is a trademark of Vaisala Oyj.

Vaisala Cirrus® is a registered trademark of Vaisala Oyj.

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2. Product overview

2.1 Introduction to Vaisala Radiosonde RS41

Vaisala Radiosonde RS41 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 uses linear resistive platinum technology. The small size of the sensor results in low solar radiation error and guarantees fast response. Wind is derived from velocity based on satellite carrier frequency changes. Height and pressure are based on satellite ranging codes, either combined with differential corrections from the ground system, or using multiple GNSS systems which enhance accuracy and mitigate GNSS interference. Pressure calculation is supplemented with temperature and humidity data. Alternatively pressure is measured with a high-quality, shock-resistant capacitive silicon sensor which provides both height and pressure for meteorological messages.

Robust design, physical zero humidity check, and built-in 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 the ground check device. To make it easier to check the status of the radiosonde, the radiosonde has LED light indicators visible on the cover.

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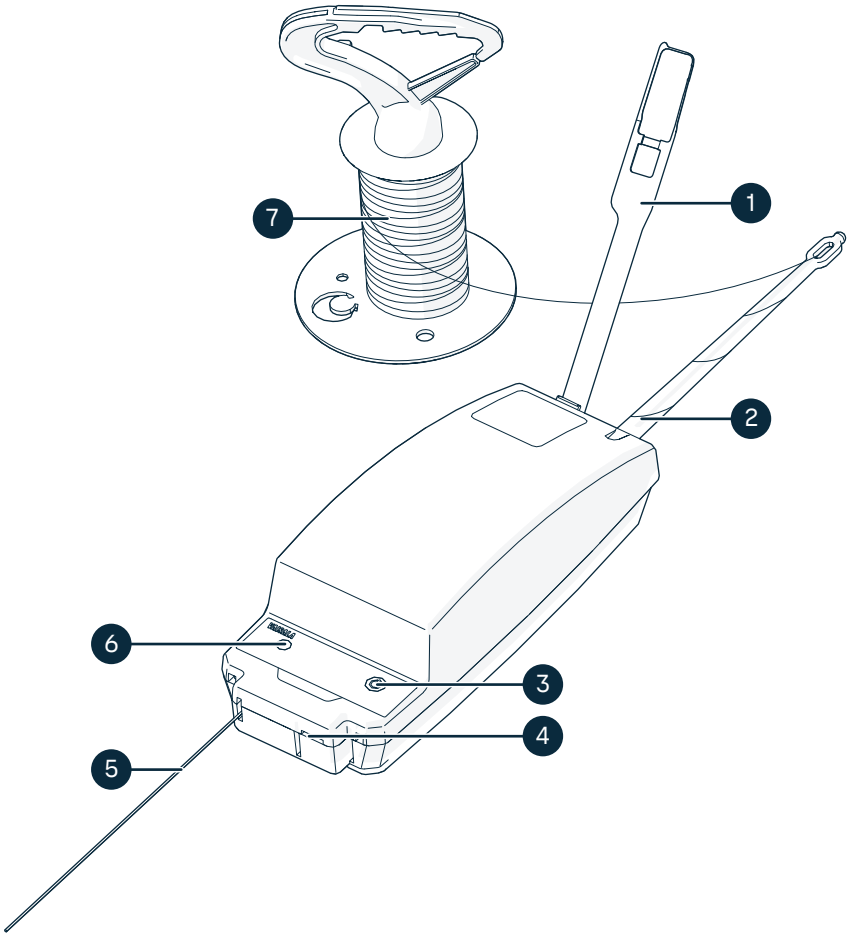


Figure 1 Vaisala Radiosonde RS41 with unwinder

1 Sensor boom
2 Unwinder pin
3 Power switch
4 Connector for additional sensor interface
5 Antenna
6 LED light
7 Unwinder

Table 3 Operating environment

Property	Description / Value
Function	Radiosonde for atmospheric measurement, outdoor use
Maximum operating altitude	> 5000 m (16 404 ft), from ground level up to 40 km (131 234 ft)
Operating temperature	−90 ... +60 °C (−130 ...+140 °F)
Operating humidity	0–100 %RH

Property	Description / Value
Power source	Battery powered, no mains power
Overvoltage category	CAT I
Use in wet location	Yes
Pollution degree	3

2.2 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.

Table 4 Unwinder properties

Object	Property
Material of the string	Non-UV treated polypropylene
Strength (pull)	<115 N
Length of the string	55 m
Unwinder weight with pin	29 g

The unwinders are shipped in the radiosonde package, packed separately from the radiosondes. This allows the operator to prepare the balloon and the unwinder at a time that is most convenient.

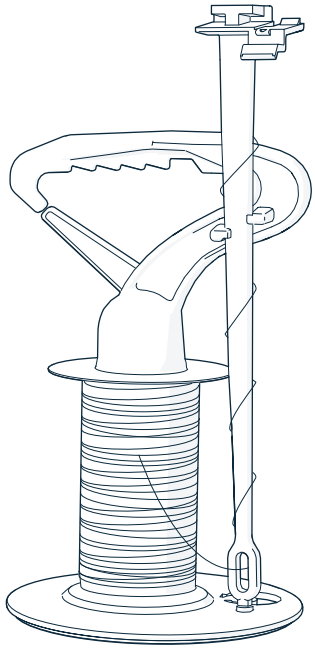


Figure 2 RS41 unwinder

2.3 Unwinder with BioTwine

The RS41 unwinder is specifically designed for use with Radiosonde RS41. The unwinder pin tied to the twine is installed to the radiosonde so that it bends the sensor boom into the correct position, ensuring repeatable results in the soundings.

Table 5 Properties of unwinder with BioTwine

Property	Description/Value
Material of the string	Cellulose-based
Strength (pull)	< 95 N
Length of the string	55 m
Unwinder weight with pin	36 g

The unwinders are shipped in the radiosonde package, packed separately from the radiosondes. This allows the operator to prepare the balloon and the unwinder at a time that is most convenient.

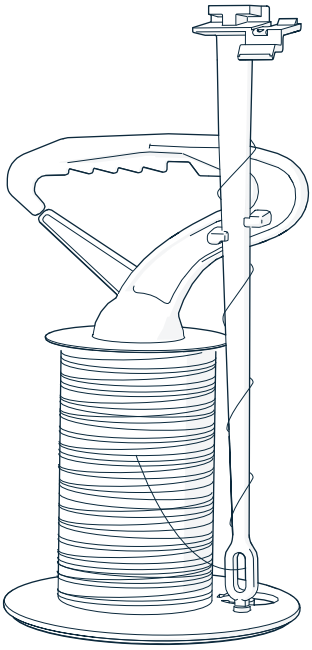


Figure 3 RS41 unwinder with BioTwine

2.4 Packing

Radiosonde RS41 is shipped in a box with 40 radiosondes. The shipping box has been tested following the standards to tolerate the mechanical and environmental transportation conditions. Inside the shipping box, the radiosondes are packed in their own handling packages.

- The shipping box size is 740 × 400 × 320 mm (length × width × height), and it weighs 10.9 kg.

Unwinders are packed in a separate cardboard box and shipped in the same box with the radiosondes. The unwinder box contains 20 unwinders.

- The unwinder box size is 375 × 300 × 70 (length × width × height), and it weighs 0.8 kg.

2.5 Safety

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.



WARNING! Vaisala recommends the use of a parachute even if it is not required by applicable restrictions.



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.

2.6 ESD protection

Electrostatic discharge (ESD) can damage electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects in the equipment housing.

To avoid delivering high static voltages to the product:

- Handle ESD-sensitive components on a properly grounded and protected ESD workbench or by grounding yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either precaution, touch a conductive part of the equipment chassis with your other hand before touching ESD-sensitive components.
- Hold component boards by the edges and avoid touching component contacts.

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2.7 Lithium battery warnings



CAUTION! Take the following precautions when handling lithium batteries:

- Do not place the lithium battery in fire or apply heat to the battery.
- Do not pierce the battery with nails, strike the battery with a hammer, step on the battery, or otherwise damage the outer casing.
- Do not subject the battery pack to strong impacts or shocks.
- Do not expose the battery to water or salt water or allow the battery to get wet.
- 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.
- 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.
- 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.
- Do not spill water on a burning battery. A fire extinguisher must be used.

3. Operation

3.1 Overview of preparing a sounding

You must carry out the prelaunch steps as instructed and always in the same way.

1. Unpack, prepare, and fill the balloon.
2. Prepare the optional sounding accessories.
3. Unpack and prepare the unwinder.
4. Attach the unwinder to the balloon. See *RS41 Unwinder Quick Guide (DOC231720)* for illustrations.
5. Unpack the radiosonde.
6. Prepare the radiosonde with the ground check device.
7. Attach the radiosonde to the unwinder.
8. Check the RS41 LED light.
9. Launch the balloon.
10. Monitor the sounding with the sounding system. See the sounding system documentation for more information.

The following sections include information on preparing the radiosonde for the sounding with Ground Check Device RI41. Radiosonde RS41 can also be prepared with Ground Check Device MWH322. For further instructions, see the appropriate sounding system documentation.

3.2 Preparing balloon



WARNING! Take extreme caution when handling the inflated balloon. Read the Safety Instructions for Balloon Operators before you start preparing the balloon.



WARNING! 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.



WARNING! Vaisala recommends preparing the balloon 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.

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3.2.1 Handling balloon

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.

1. Open the balloon package carefully.

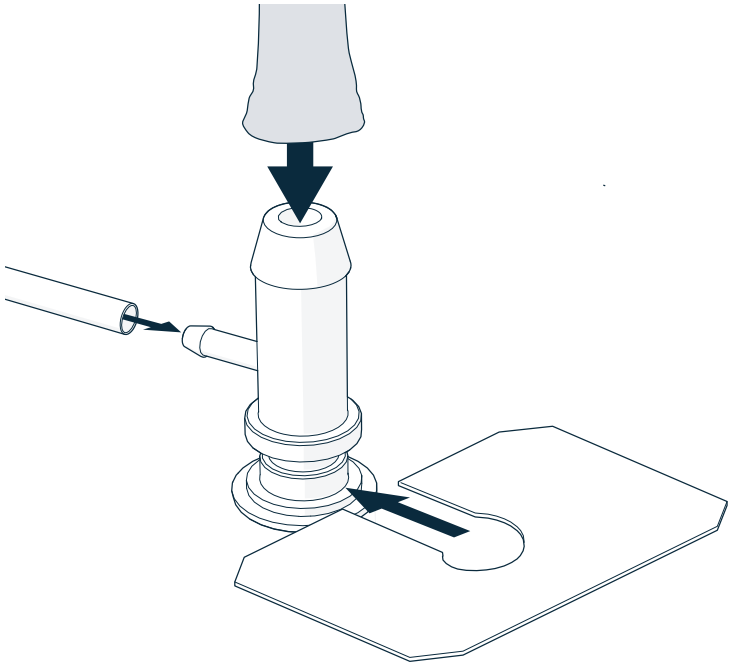
CAUTION! To avoid damaging the balloon, be extremely careful when opening the package with a knife or other sharp object.

2. Check visually that the balloon is structurally sound and has no perforations or other apparent defects in the nozzle section.

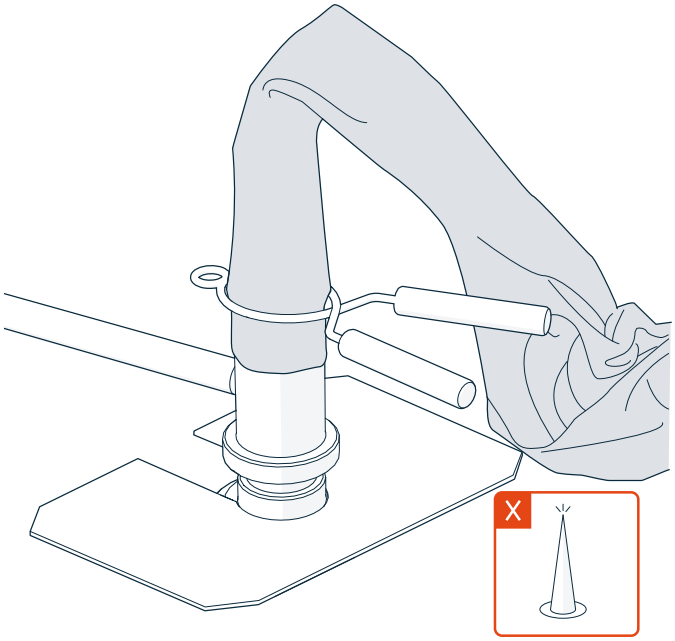
3.2.2 Filling balloon

These balloon-filling instructions are based on Totex balloons, but they also apply to other meteorological balloons.

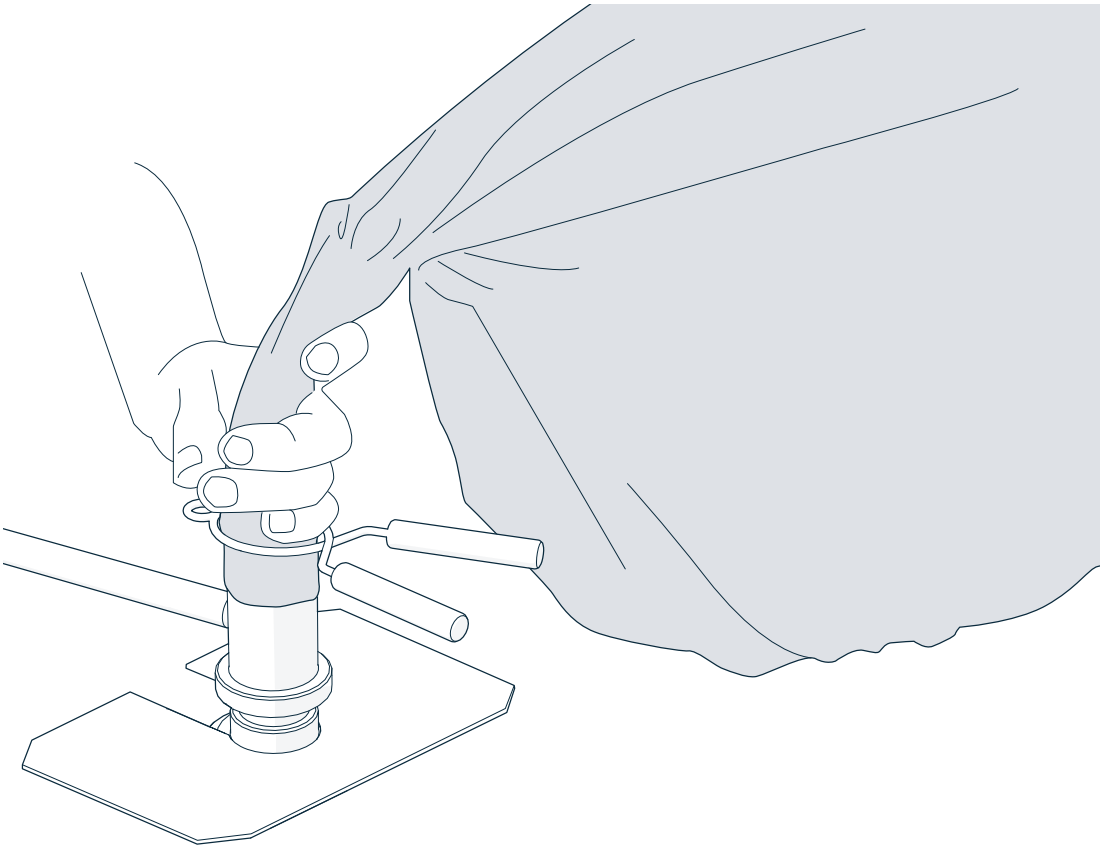
1. Connect the side tube of the filling balance to the pressure reducing valve on the gas cylinder (or hydrogen generator) with a flexible plastic hose.
2. Select the nozzle which best fits into the neck of the balloon.
3. Load the additional weights that are needed to obtain the required lift, for example, Vaisala Filling Balance FB13 weights as in the figure below.



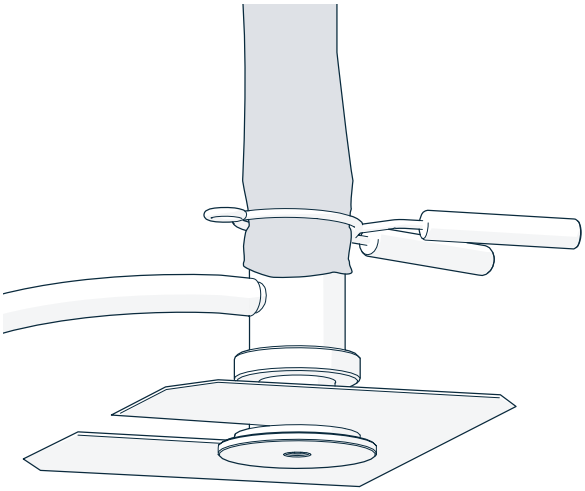
4. Secure the neck of the balloon to the balance nozzle with a clamp as shown in the figure below. Look out for sharp objects near the filling balance so that no damage is caused to the relaxed balloon.



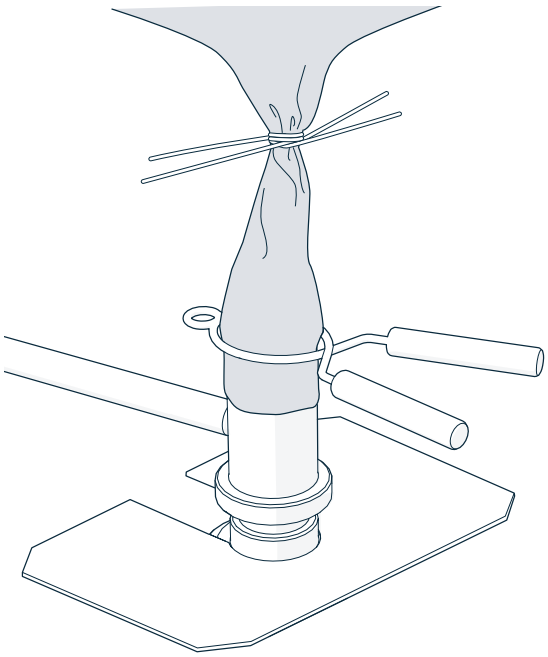
5. Turn on the gas from the pressure reducing valve. Let the gas flow slowly into the balloon. Do not leave the balloon-filling shed while inflating the balloon. Follow the balloon manufacturer's instructions when inflating the balloon.



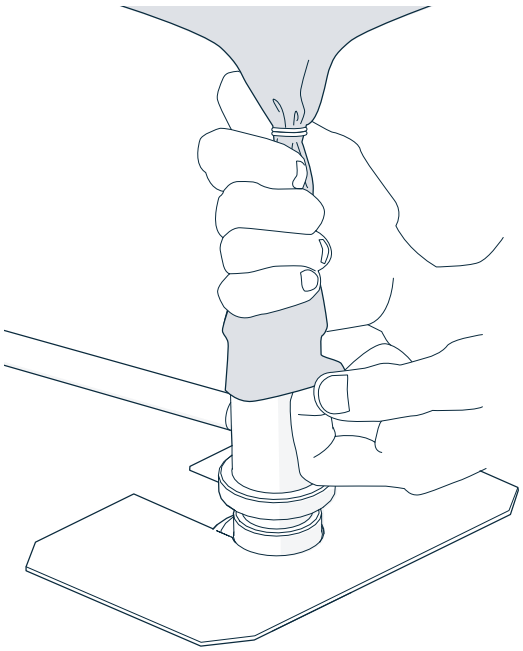
6. When the balloon is sufficiently filled, in other words, the balloon just raises the gas nozzle, close the gas valve.



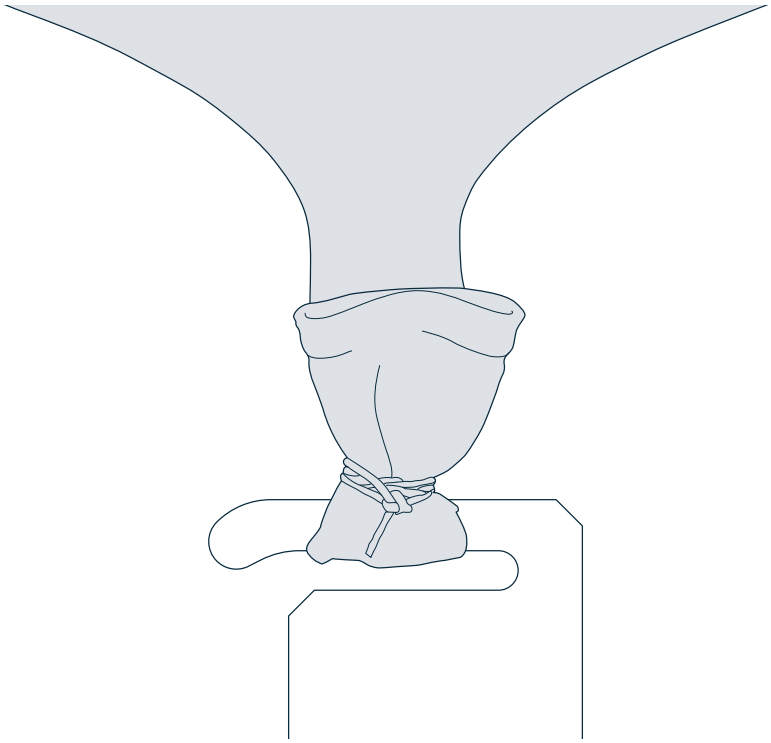
7. Before removing the balloon from the gas nozzle, tie the neck of the balloon tightly above the balance nozzle with approximately 0.5 m (2 ft) bit of string.



8. Remove the balloon from the gas nozzle.



9. Fold the neck of the balloon over and secure firmly. Cut off any extra string. The figure below shows an example of a secured balloon neck. In the figure, the balloon is attached to a balloon holder hook to make the installation of the unwinder hook to the folded balloon neck easier.



10. When the balloon is ready, make sure it does not touch anything. Hold the inflated balloon by the neck.

3.3 Preparing optional sounding accessories

The unwinder is designed to be attached directly to the folded balloon neck, but in case you cannot attach the unwinder to the balloon, the unwinder can also be used with optional sounding accessories which provide the necessary support during the sounding. The sounding accessories are needed to restrict the movement of the unwinder. Optional sounding accessories here refer to a hanger board or a parachute.

The unwinder must always be attached to a relatively firm support. The support must not let the unwinder twist freely, or otherwise the string may unwind at too high a speed and the radiosonde hit the ground during the launch. The unwinder must be able to swing slightly during the sounding.

Similar to the balloon, the unwinder and the optional sounding accessories must be prepared before launching the radiosonde. The following figure shows the different options.

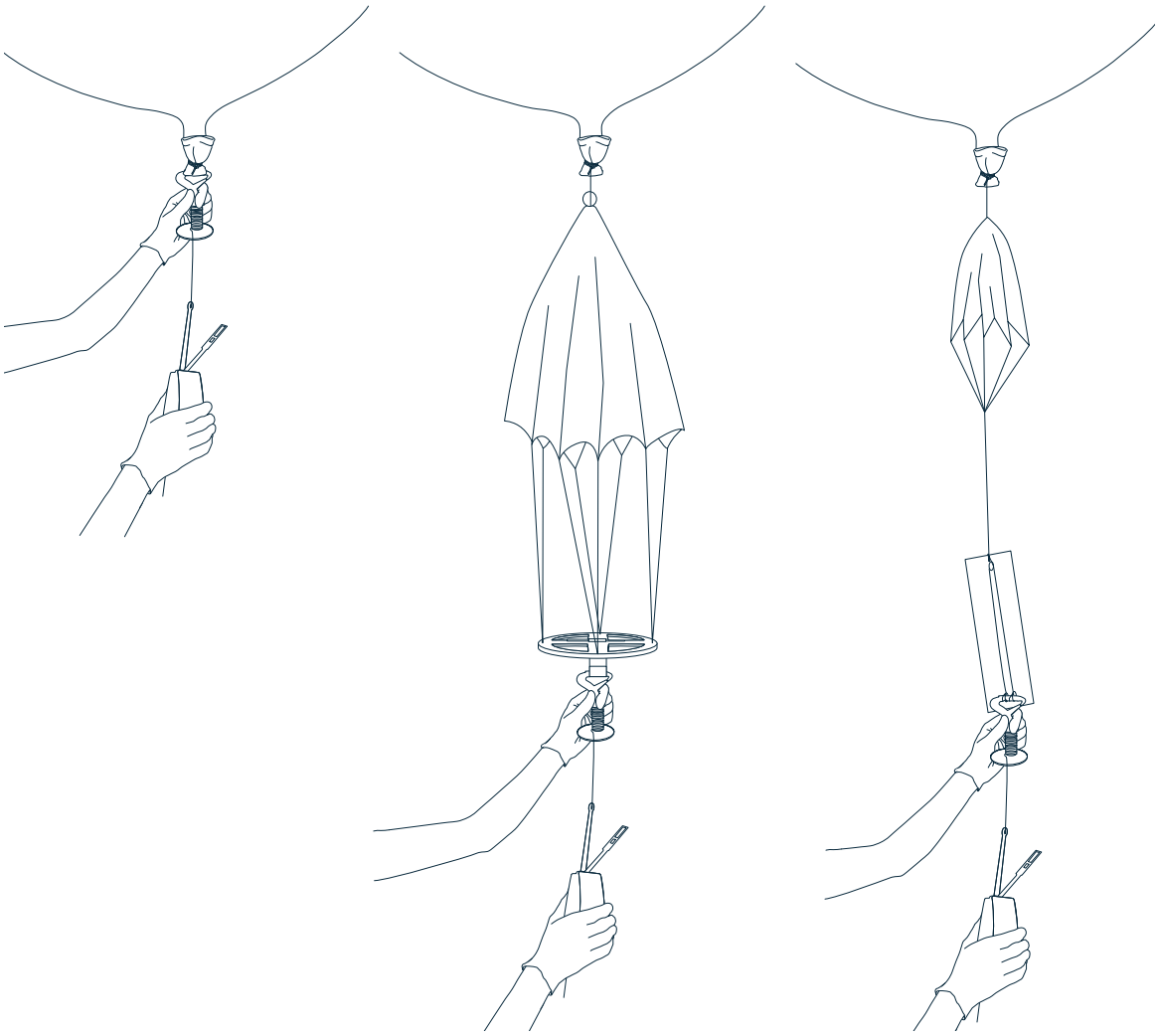


Figure 4 Radiosonde RS41 optional accessories

CAUTION! The strength of all the strings used during soundings must not exceed 23 kp (230 N). Knots in the strings weaken the strength to the minimum of 45 % of the original string strength. This results in a string strength of 10 kp (100 N) which is sufficient for soundings with Radiosonde RS41.

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

Visit vaisala.com/RS41 to watch short videos on how to make a hanger board and how to attach the unwinder to the hanger board, and how to attach the unwinder to the parachute.

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3.3.1 Preparing Totex parachute 5710-5

The recommended parachute with big balloons (> 300 g) is Totex type 5710-5 (Vaisala code 15045). See option 1 in Figure 4 (page 20).

1. The parachute 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.

3.3.2 Preparing Totex parachute 280V-17

The recommended parachute with small balloons (< 200 g) is the Totex type 280V-17 (Vaisala code 249041). See option 1 in Figure 4 (page 20).

1. The parachute 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.

3.3.3 Preparing non-Totex parachute

1. If you are using a parachute that has no firm objects to prevent the unwinder from twisting, use a hanger board. The hanger board provides more stability during the sounding. See option 3 in Figure 4 (page 20).

3.3.3.1 Making hanger board

See the steps below for instructions on how to make a hanger board out of the radiosonde cardboard package. See also the video at vaisala.com/RS41.



To make the hanger board, you need the following items:
- Radiosonde handling box cardboard package
- Scissors
- Some string. The string used with the hanger board must have a diameter of > 1.5 mm and the strength must be 250–350 N.

1. Cut the radiosonde cardboard package to 1 whole piece that is big enough to make a hanger board.
2. Make 1 hole at one end of the hanger board, 4 holes at the other. Make the 4 holes so that 2 holes are on top of each other.
3. Tie a string on the unwinder hook.
4. Thread the string through the 4 holes so that the unwinder is firmly attached to the other end of the hanger board.
5. Pull the same string through the hole at the other end of the hanger board and attach the string to the parachute. The string now runs across the hanger board.

3.4 Preparing RS41 unwinder

When you perform a sounding with no optional accessories, the unwinder is attached directly to the balloon. See option 2 in Figure 4 (page 20).

Visit vaisala.com/RS41 to watch a short video on how to attach the unwinder to the balloon.

It is very important to prepare the unwinder carefully, following the given instructions. Correct handling of the unwinder ensures a successful sounding.

3.4.1 Detaching unwinder pin

To start using the RS41 unwinder, you must first detach the unwinder pin from the unwinder body.

1. The unwinder pin (number 1 in the following figure) is attached between 2 plastic clips in the unwinder hook (number 2). Detach the pin from between the plastic clips and pull it out from the unwinder bottom plate (3).

   If the unwinder pin is tightly attached to the bottom plate, it is a good idea to slightly twist the unwinder pin before pulling it out.

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2. When you pull the unwinder pin out, make sure that the string unwinds and that it is not tangled.

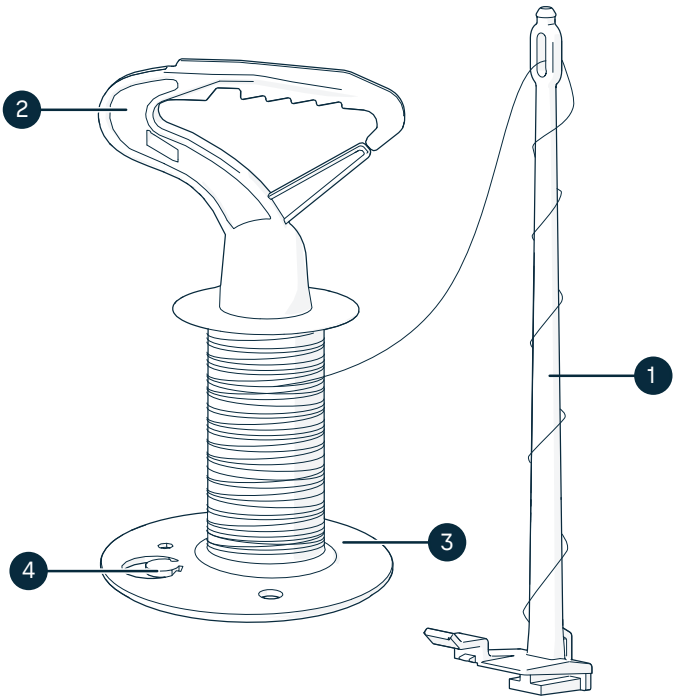


Figure 5 RS41 unwinder details

1 Unwinder pin
2 Unwinder hook
3 Unwinder bottom plate
4 Unwinder clip

3.4.2 Handling unwinder string

In the unwinder body, the unwinder string runs under a round plastic clip on the bottom plate. This keeps the string attached to the unwinder, and the radiosonde attached to the balloon.

1. To prevent the string from getting tangled in the clip during the sounding, make sure that the round plastic clip is level with the unwinder bottom plate.

2. If the clip is bent up, bend it gently back to level position.

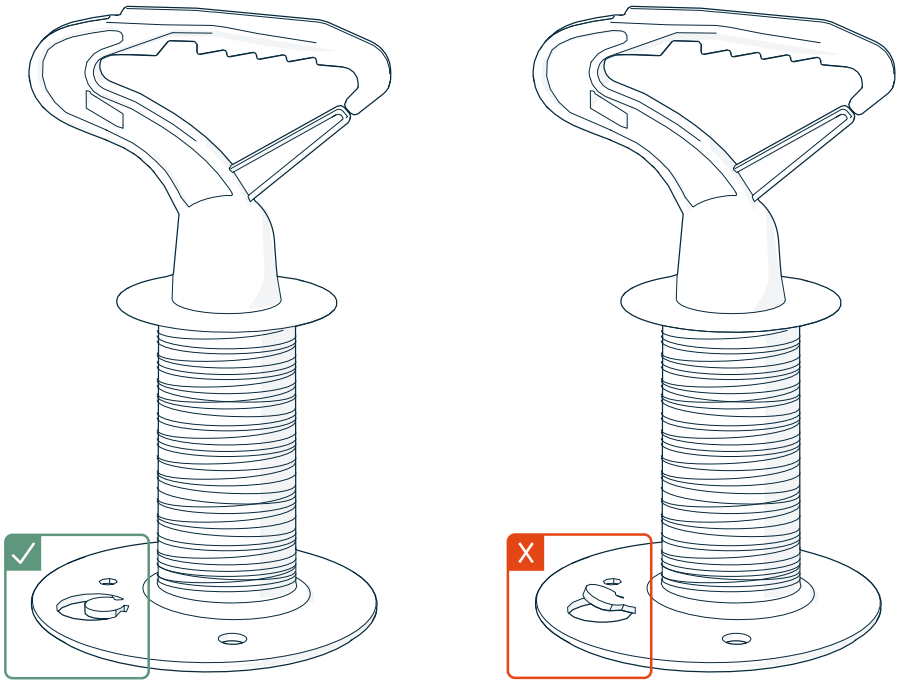


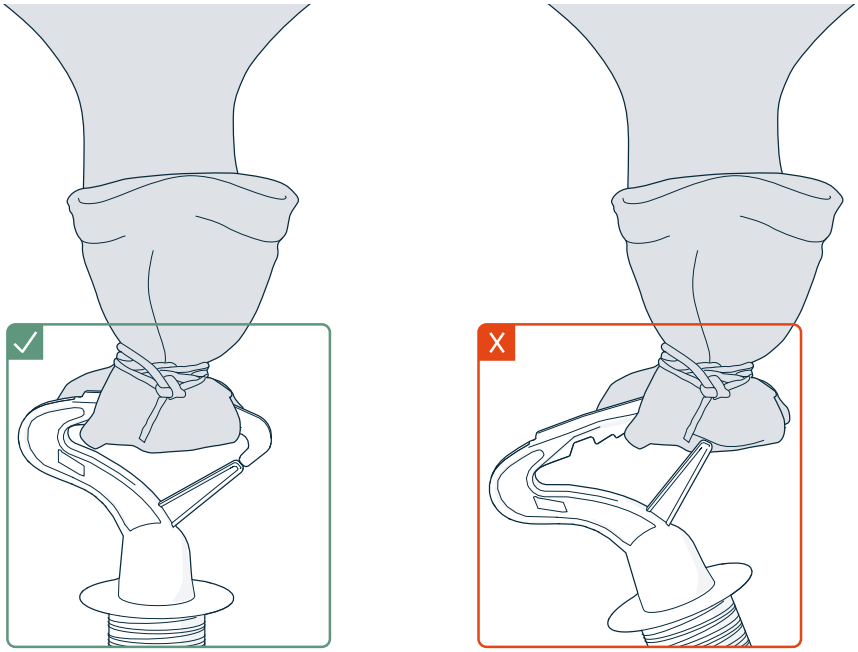
Figure 6 Unwinder clip is level with the unwinder bottom plate

3.4.3 Attaching unwinder to balloon

The unwinder must be attached firmly, so that it is not able to twist freely, or the string may unwind at too high a speed and the radiosonde hit the ground during the launch. The unwinder must be able to swing slightly during the sounding. Follow the steps and figures below to attach and align the unwinder correctly when it is attached directly to the balloon.

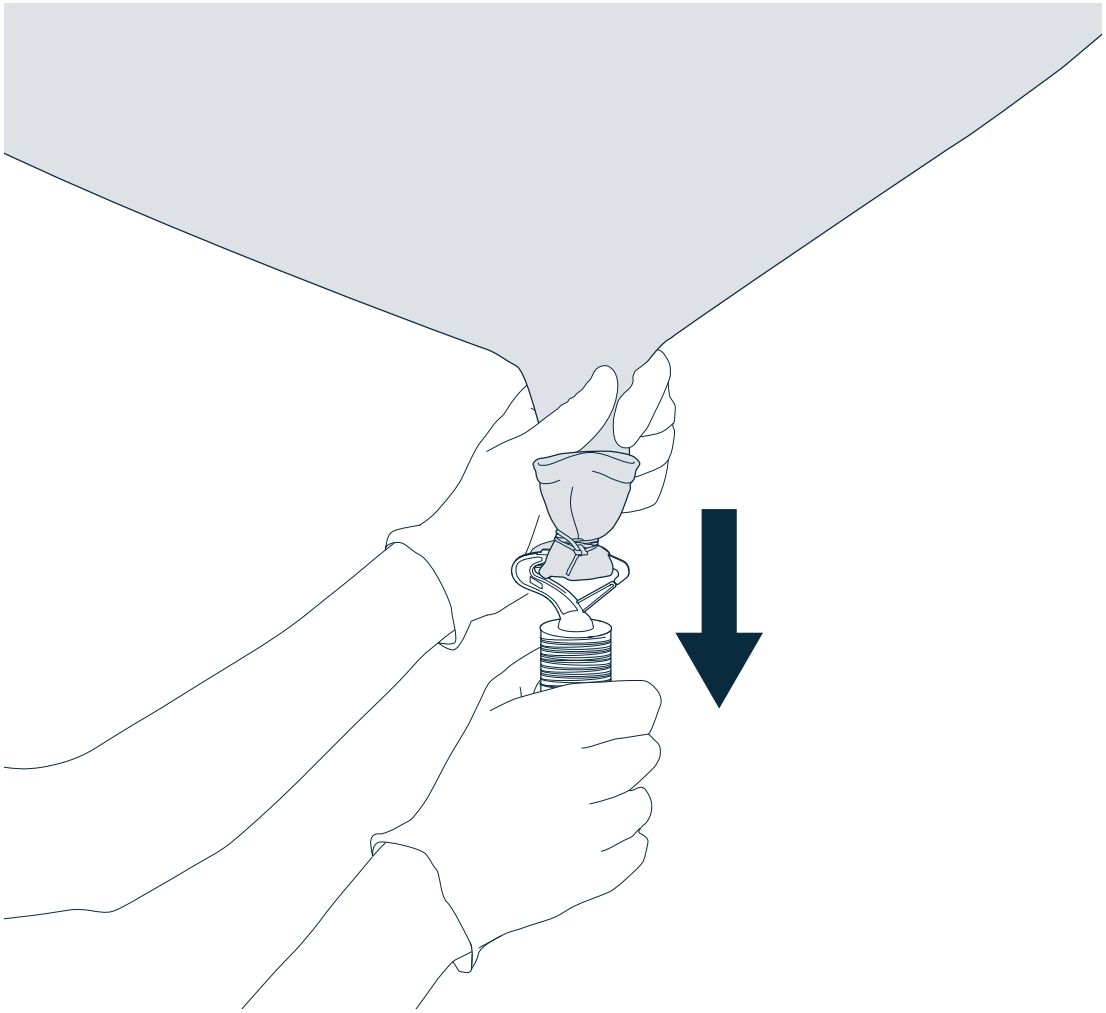
1. Pass the unwinder hook through the loop created by the tied balloon neck.

2. Make sure that the hook comes out the other side, as shown in the following figure.



The unwinder is now firmly attached to the balloon.

3. Align the unwinder so that it points directly downwards from the balloon neck.



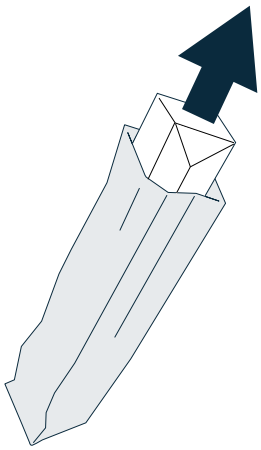
CAUTION! To ensure a successful sounding, align the unwinder so that it points downwards from the balloon neck.

3.5 Unpacking radiosonde

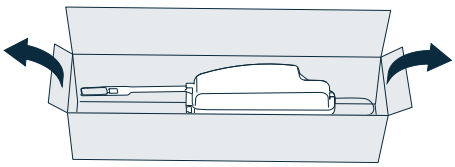
1. Open the foil bag.



2. Take the cardboard box out from the foil bag.

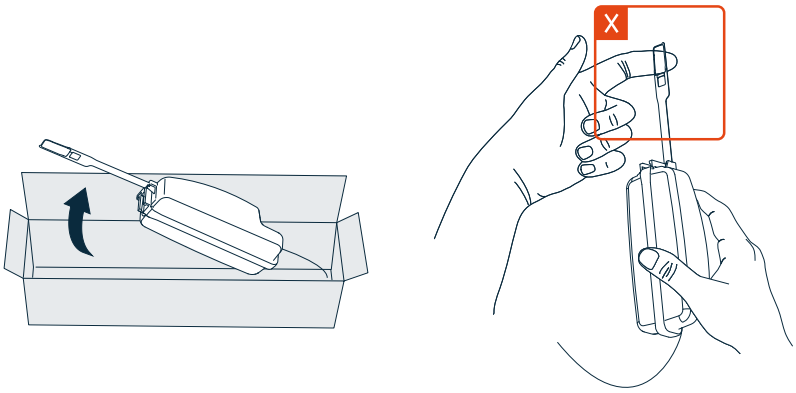


3. Open the cardboard box and unfold the side flaps.



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4. Carefully unpack the radiosonde so that you lift it the sensor boom side first from the cardboard box. Do not touch the sensor boom.



3.6 Preparing radiosonde with Ground Check Device RI41

In the sounding preparations, RI41 is connected to the sounding software computer with 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 computer.

For information on configuring RI41 as the ground check option in the sounding software, see the applicable manual that also provides information on other options for preparing the radiosonde for the sounding.

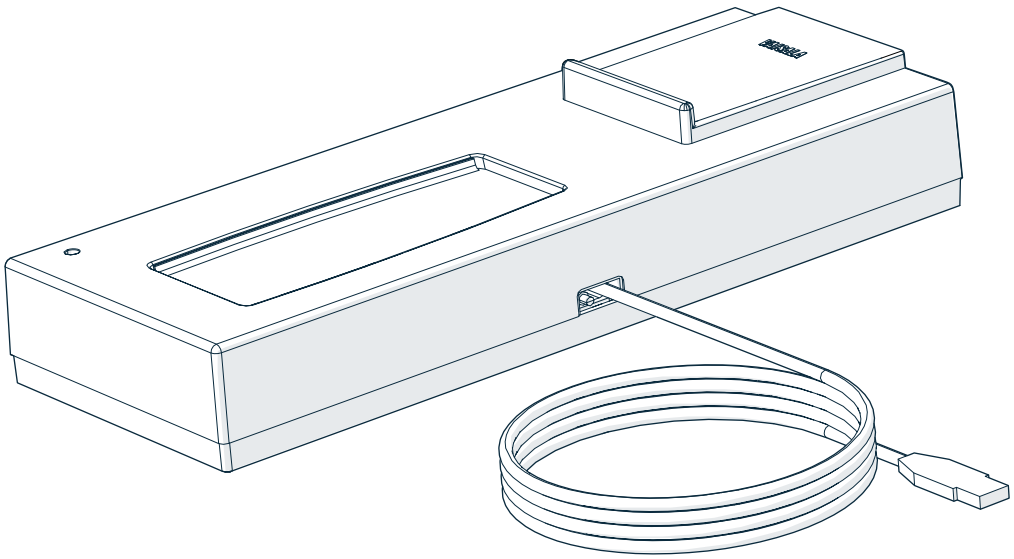
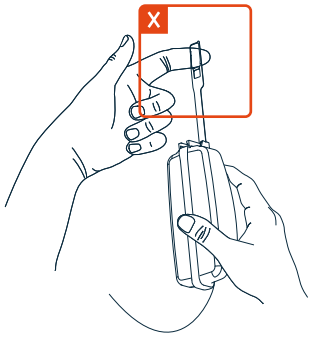
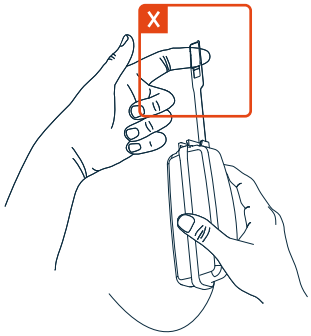


Figure 7 Ground Check Device RI41

CAUTION! Do not touch the radiosonde sensors. They are fragile and can be easily contaminated.



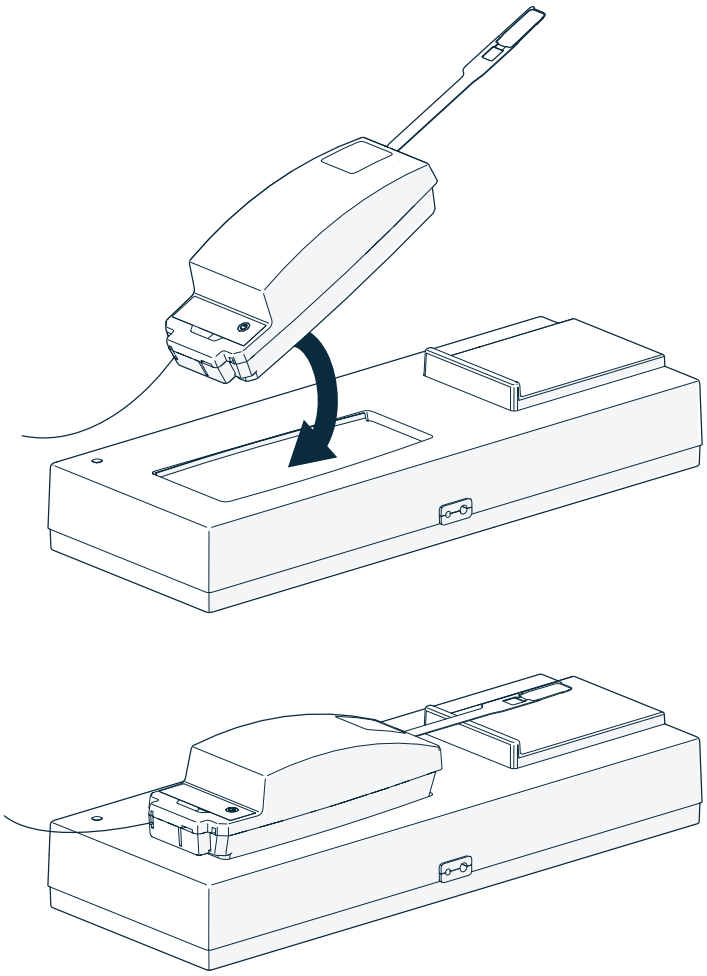
WARNING! During humidity sensor reconditioning, the temperature of the sensor boom is about 150 °C for 3 minutes.



Follow the steps below to prepare the radiosonde for a sounding with RI41:

1. Place the radiosonde on the ground check device carefully. Make sure that you place the radiosonde the back end (antenna end) of the radiosonde on the device first.

> **CAUTION!** Make sure that the radiosonde sensor boom does not hit the support plate on the ground check device, as this may damage the sensor boom.



The sounding software automatically detects the radiosonde and begins the sounding preparations.

2. During the radiosonde preflight preparation phase, the sounding software performs several steps. These steps consist of ground check procedures for sensors, as well as optional features for setting the radiosonde inflight operation parameters, such as a timer for turning the radiosonde power off after a desired time, pressure, or altitude.

   In this phase, you can also set the radiosonde transmitter frequency or, alternatively, apply the station's default frequency. Use the sounding software to modify the settings. The preflight procedure depends on the radiosonde and ground check device model.
   - RS41-SG with RI41:
     - T check: The radiosonde performs an built-in functional temperature check.
     - Reconditioning: Preparation of humidity sensor. Cooling after reconditioning
     - U check: The radiosonde performs a physical zero humidity check.
     - Updating radiosonde: The parameters and preparation results are updated to the radiosonde.
   - RS41-SGP with RI41 or RI41-B:
     - T check: The radiosonde performs an built-in functional temperature check.
     - Reconditioning: Preparation of humidity sensor.
     - Cooling after reconditioning
     - U check: The radiosonde performs a physical zero humidity check.
     - Stabilizing: Waiting for the pressure sensor to stabilize. Enter the pressure reference value from your own reference source or, with RI41-B, retrieve the pressure reference value automatically from the barometer module in RI41-B.
     - Ground check: Once the conditions have stabilized, that is, the PTU values are steady, ground check is performed.
     - Updating radiosonde: The parameters and preparation results are updated to the radiosonde.
3. After the ground check is finished, the sounding software indicates the results with a message. Remove the radiosonde from the ground check device.

   Before the radiosonde is launched, you can return to the preparation phase anytime by placing the radiosonde on the ground check device again. The sounding software automatically returns to the ground check phase.
4. 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.

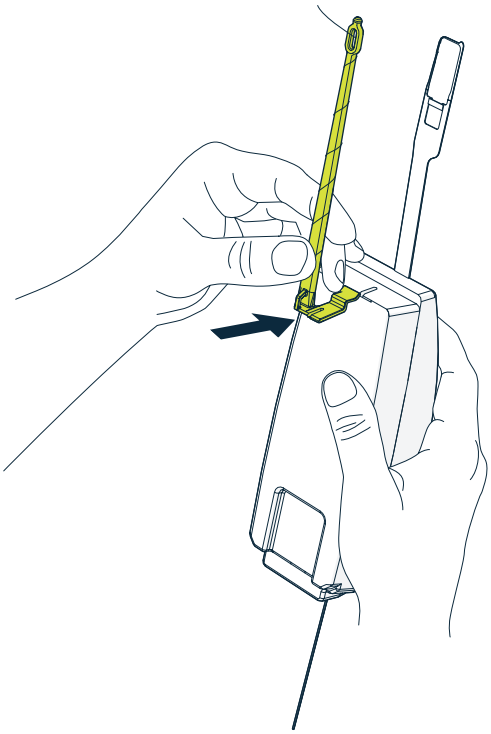


Vaisala recommends releasing the radiosonde within 1 hour after the ground check. Keep the prepared radiosonde in office conditions (<60 %RH, free of contaminants, such as aerosols, glues, chemicals, and dust). If you cannot release the radiosonde within 1 hour, repeat the ground check.

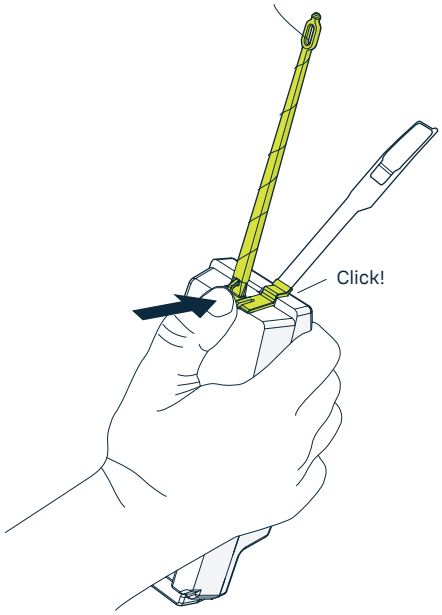
3.7 Attaching radiosonde to unwinder

Before launching the radiosonde, bend the sensor boom to the correct sounding position using the unwinder pin. This also attaches the radiosonde to the unwinder and the balloon.

1. Push the unwinder pin to its position at the end of the radiosonde.



2. As you push, the unwinder pin pushes the sensor boom to the bent position and the unwinder snap lock clicks into place.



3. Make sure that the unwinder is firmly attached to the radiosonde.

3.8 Checking RS41 LED light

1. After preparing the radiosonde for the sounding, check the radiosonde status on the radiosonde cover. When the green LED is on, the radiosonde is ready for release. After the launch, the LED light switches off.

Table 6 RS41 LED lights

LED	Meaning
Green LED is blinking.	The reconditioning of the humidity sensor and sensor checks are in progress and/or the radiosonde is not receiving GNSS signal. To receive the GNSS signal, take the radiosonde outside with line of sight to GNSS satellites.
Green LED is continuously on.	a. The radiosonde is ready and working. The diagnostics cover the temperature and humidity sensors. b. GNSS satellites are detected after startup. If the LED starts blinking, there may be a GNSS blind spot (for example, inside the balloon shelter). Take the radiosonde outside with line of sight to GNSS satellites before launch. c. Telemetry from RS41 is working. Even if the radiosonde LED light is continuously lit and green and the telemetry is working, it does not indicate that the sounding software receives data from the radiosonde. Check from the sounding software that the sounding software receives the data.
Red LED is on.	Error. Check the sounding software for any error messages.
Red LED is blinking.	Additional sensor is not connected.

4. Storage and transportation

4.1 Storage

Store and use radiosondes in accordance with applicable instructions, the User Guide, and specifications issued by Vaisala.

Keep radiosondes 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 ... +40 °C
- Relative humidity below 85 %



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

4.2 Transportation

Transport Vaisala radiosondes 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.

4.2.1 Transporting RS41 radiosondes with lithium batteries

RS41 radiosondes with lithium batteries are classified as:

- 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, similar to the one shown in the following example. The original radiosonde shipping package must be used for transport, and it already has the lithium battery handling label.

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- 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.



Figure 8 Lithium battery handling label

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

Appendix A. Safety instructions for balloon operators

Place a copy of this list in clear view in the balloon filling shed and in the sounding compartment.

WARNING! New operators must carefully study the instructions for using the hydrogen generator and for the correct method of inflation.

WARNING! All users must follow these safety rules to avoid injury or damage to the equipment.



Wear protective eyewear.

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. Regularly check that the gas tube fits securely to the gas cylinder or generator nozzle and to the balloon inflation nozzle.
4. Take care to prevent a gas leak in the shed when interrupting inflation to replace a gas cylinder.
5. Never use a repaired balloon.
6. If a leak develops 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.
7. Do not touch the balloon with bare hands except when holding it by the neck. Wear soft cotton gloves.
8. Make sure that there are no pointed objects in the shed. Nails, hooks, hinges, padlocks, and similar, are dangerous as they may 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.
9. Keep the doors of the shed shut while inflating the balloon on a windy day. Make sure that the shed is properly ventilated.
10. No unauthorized person shall be allowed admittance to the shed while the hydrogen generator is in operation or balloon inflation is going on.

11. Make sure that all tools and other implements not essential for balloon inflation have been removed from the shed.
12. Do not take any electrical devices, for example a cellphone, to the balloon filling shed or close to the balloon inflated with hydrogen. A safe distance when outdoors is typically 1.5 m.
13. Always keep the radiosonde at least 50 cm below the level of the gas nozzle and the inflated balloon, and at least 1.5 m away from the gas cylinder/hydrogen generator, connectors, and tubing. Avoid taking the radiosonde inside the balloon filling shed, if possible.
14. Follow all regulations concerning hydrogen safety.

Appendix B. Radiosonde warranty

VAISALA

This document is an integral part of the latest version of "General Conditions of Sale and Service of Vaisala Oyj", Ref. DOC247980. In case of discrepancy, the provisions of the Vaisala radiosonde warranty prevails.

Vaisala Radiosonde RS41 warranty

Vaisala repairs or, at its discretion, replaces any Vaisala Radiosonde RS41 that is proven, with reasonable satisfaction, to have failed within 24 months of shipment by reason of faulty materials or workmanship, under the following conditions and provided that radiosonde is transported, stored and used properly in accordance with applicable instructions and manuals issued by Vaisala.

Storage conditions

Vaisala Radiosonde RS41 shall be stored indoors in its original unopened vacuum envelope within the following environmental limits (ref. IEC 60721-3-1 class 1K2):

- 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 AS15 is 30, in AS41 60 days
- temperature +15 °C to +35 °C
- relative humidity below 60 %

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 applied. Instructions on the packaging for transportation and handling shall be followed.

Criteria for radiosonde failures

Preflight failures under warranty:

- Radiosonde fails during the sounding preparation after the second attempt
- Ground check with RI41(-B) or MWH322 exceeds one of the following limits:
  T: Gross error detected (OK/not OK, ± 3 °C, stable indoor conditions)
  U: ± 2 % RH (at RS41 generated physical zero humidity, stable indoor conditions)
- Ground check of radiosonde's pressure sensor exceeds the following limit:
  P: ± 3 hPa (against precision barometer, for example, Vaisala RI41-B)

Inflight failures below altitude of 100 hPa under warranty:

- Radiosonde stops transmitting one or more parameters
- Radiosonde transmits clearly erroneous data

Early termination of sounding caused by failure in ground equipment, balloon burst, user error, or any external cause, for example, icing, is not covered by this warranty.

Making warranty claims

Information 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 or a mutually agreed report containing requested information shall be used for this.

A radiosonde found defect prior to launch shall be returned to the Vaisala office if specifically requested by Vaisala Helpdesk.

Failure report of an inflight failure shall be accompanied with the sounding data file (in .mwx format).

The warranty claim shall be sent to Vaisala within a year after the failure.

When returning radiosondes that contain lithium batteries, refer to the shipping instructions in the applicable radiosonde User's Guide.

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Technical support



Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see vaisala.com/support.

Recycling



Recycle all applicable material according to local regulations.

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