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DATASHEET

# RS41-SG

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# Radiosonde RS41-SG



Vaisala radiosondes are known for their accuracy, reliability, and ease of use.

## Features

- Superior PTU measurement performance
- Automated ground check
- Robust and easy-to-use design with informative LEDs
- GNSS for reliable wind data availability as well as height and pressure calculation
- Stable narrow band transmission complies with ETSI standard EN 302 054
- Unwinder pin for consistent sensor boom positioning

## Temperature and humidity sensors

Vaisala Radiosonde RS41 temperature sensor is stable, using linear resistive platinum technology. The small size of the sensor results in low solar radiation error and guarantees fast response. It also effectively protects against evaporating cooling, the phenomenon occasionally encountered when a radiosonde emerges from a cloud top.

RS41 humidity sensor integrates humidity and temperature sensing elements to provide unique features. Preflight automatic recondition of the humidity sensor effectively removes chemical contaminants and ensures excellent humidity measurement accuracy. The integrated temperature sensor compensates the effects of solar radiation in real time resulting in very precise measurement. The sensor heating function enables an active and effective deicing method at freezing conditions during the flight. The humidity sensor responds quickly to detect fine structures of the atmosphere.

## RS41 ground check

Automated ground check before flight includes temperature check, humidity sensor recondition, humidity check, and setting radiosonde parameters.

## Wind data, height, and pressure

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.

## Data transmission

RS41 has proven data transmission from radiosonde to receiver up to 350 km. Data availability during a sounding is guaranteed with digital error correction code transmission and telemetry errors are always detected. Due to narrower band transmission, more channels are available in the meteorological frequency band.

## RS41 calibration

RS41 temperature and humidity sensors are calibrated against the references that are traceable to SI standards and measurement uncertainties are estimated according to recommendations of Joint Committee for Guides in Metrology, 100:2008.

## Unwinder

With the unwinder the radiosonde sensor boom is automatically set in an ideal position for sounding. As the unwinder is separated from the radiosonde, you can prepare the balloon and unwinder in advance to streamline launch preparations.

## Additional sensor connector

RS41 has a serial interface for additional sensors, primarily to connect ozone interface to RS41. You can also connect other sensors with XDATA protocol. The data is transferred either directly or through ozone interface to a RS41 radiosonde and further to Vaisala sounding system.

# Technical data

## Measurements

| | |
|---|---|
| Measurement cycle | 1 s |
| **Temperature sensor** | **Type: Platinum resistor** |
| Measurement range | +60 ... −95 °C |
| Resolution | 0.01 °C |
| Response time (63.2 %, 6 m/s flow, 1000 hPa)[1)] | 0.5 s |
| Stability (1 year / 3 years) | < 0.05 °C / < 0.1 °C |
| Accuracy: | |
| Repeatability in calibration | 0.1 °C |
| Combined uncertainty after ground preparation<br>Combined uncertainty in sounding < 16 km<br>Combined uncertainty in sounding > 16 km | 0.2 °C<br>0.3 °C<br>0.4 °C |
| Reproducibility in sounding [2)] | > 100 hPa: 0.15 °C<br>< 100 hPa: 0.30 °C |
| **Humidity sensor** | **Type: Thin-film capacitor** |
| Measurement range | 0 to 100 %RH |
| Resolution | 0.1 %RH |
| Response time: 6 m/s, 1000 hPa | +20 °C: < 0.3 s<br>−40 °C: < 10 s |
| Accuracy: | |
| Repeatability in calibration | 2 %RH |
| Combined uncertainty after ground preparation | 3 %RH |
| Combined uncertainty in sounding | 4 %RH |
| Reproducibility in sounding [2)] | 2 %RH |
| **Pressure** | **Type: Calculated from GNSS** |
| Measurement range | From surface pressure to 3 hPa |
| Resolution | 0.01 hPa |
| Accuracy: | |
| Combined uncertainty / Reproducibility in sounding [2)] | > 100 hPa: 1.0 hPa / 0.5 hPa<br>100-10 hPa: 0.3 hPa / 0.2 hPa<br>< 10 hPa: 0.04 hPa / 0.04 hPa |
| **Geopotential height** | **Type: Calculated from GNSS** |
| Measurement range [3)] | From surface to 40 000 m |
| Resolution | 0.1 gpm |
| Accuracy: | |
| Combined uncertainty in sounding | 10.0 gpm |
| Reproducibility in sounding [2)] | 6.0 gpm |
| **Wind speed** | |
| Velocity measurement uncertainty [4)] | 0.15 m/s |
| Resolution | 0.1 m/s |
| Maximum reported wind speed [3)] | 180 m/s |
| **Wind direction** | |
| Directional measurement uncertainty [4)] | 2 deg |
| Resolution | 0.1 deg |
| Wind direction range | 0 to 360 deg |

*1) After applying time-lag correction, the effect to measurement uncertainty is negligible.*
*2) Standard deviation of differences in twin soundings, ascent rate above 3 m/s*
*3) In practice unlimited*
*4) Standard deviation of differences in twin soundings. Wind speed above 3 m/s for directional measurement uncertainty.*

## Telemetry

| | |
|---|---|
| Transmitter type | Synthesized |
| Frequency band | 400.15 – 406 MHz |
| Tuning range | 400.16 – 405.99 MHz |
| Maximum transmitting range | Up to 350 km |
| Frequency stability, 90 % probability | ±2 kHz |
| Deviation, peak-to-peak | 4.8 kHz |
| RF compatibility | According to EN 302 054 |
| Output power (high-power mode) | Min. 60 mW |
| Modulation | GFSK |
| Data downlink | 4800 bit/s |
| Frequency setting | Wireless with ground check device |
| Authentication algorithm | HMAC-SHA256 [1)] |

*1) Requires Vaisala Cirrus Sounding System MW51*

## GNSS receiver

| | |
|---|---|
| GNSS systems | GPS, Galileo [1)], BeiDou [1)] |
| Number of channels | ≥ 48 |
| Frequency | 1575.42 MHz, L1 C/A code |
| Cold start acquisition time | 35 s (nominal) |
| Reacquisition time | 1 s (nominal) |
| Reporting resolution of lat, lon position values | 1e-8° |

*1) Requires Vaisala Cirrus Sounding System MW51*

## Operational data

| | |
|---|---|
| Power-up | Wireless or with switch |
| Factory calibration | Stored on Flash memory |
| Battery | 2 pcs AA-size Lithium cells |
| Operating time | > 240 min |
| Weight | 80 g |
| Dimensions (for cover, without wire antenna) | Body (L × W × H): 155 × 63 × 46 mm<br>Sensor boom bent (L × W × H): 282 × 63 × 104 mm |

## Additional sensor support

| | |
|---|---|
| Protocol support | XDATA |
| Transfer rate | Max. 200 bytes/s |

## Unwinder

| | |
|---|---|
| Material of the string | Non-UV treated polypropylene |
| Strength (pull) | <115 N |
| Length of the string | 55 m |
| Unwinding speed | 0.35 m/s |
| Weight | 25 g |

The performance data is expressed with 2-sigma confidence level (k=2), unless otherwise specified. For humidity, the performance data is valid T > -60 °C.

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