DATASHEET

RS41-SGM

Vaisala · Authorized Partner

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Radiosonde RS41-SGM



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

Features

- Improved security thanks to radio silence and encryption
- Superior PTU measurement performance
- Automated ground check
- Robust and easy-to-use design
- 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 for consistent sensor boom positioning

Improved security

Vaisala Radiosonde RS41-SGM features radio silence (patent EP2689279 and US 9,972,198, Method for launching and a radiosonde), which improves security of defense operations. Radiosonde transmission does not reveal the balloon launch location because the radiosonde transmitter is not switched on until a specified height or time from launch has been reached. Data is recorded also during the radio silence and, when the radio silence ends, transmitted to the ground equipment. Transmitted data is also encrypted.

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.

Short range wireless communication link with range around 4 cm is used in ground check devices for data transfer during the ground check.

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.

RS41 calibration

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

Operational benefits

RS41-SGM has been designed for mobile use in the field. In its transport package, it has been tested to comply with MIL-STD-810G for transit drop, vibration, low and high temperature, and low pressure.

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 Combined uncertainty in sounding < 16 km Combined uncertainty in sounding > 16 km	0.2 °C 0.3 °C 0.4 °C
Reproducibility in sounding [2)]	> 100 hPa: 0.15 °C < 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 −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 100-10 hPa: 0.3 hPa / 0.2 hPa < 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
Tuning range	400.16- 405.99 MHz
Frequency band	400.15 - 406 MHz
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 MWH322/RI41
Radio silence	Up to 5 km or 20 min
Data encryption (stream cipher)	128-bit key
Transmitter termination	User-selectable based on timer or height
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 x W x H): 155 x 63 x 46 mm Sensor boom bent (L x W x H): 282 x 63 x 104 mm
Environmental tests (transit drop, vibration, low and high temperature and low pressure)	MIL-STD-810G

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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