Windsond S2 datasheet

Miniature radiosonde

Windsond S2 is the smallest and most lightweight radiosonde on the market. Use it together with Sparv Embedded RR4 radio receiver. The small sonde doesn't need a parachute.



General specifications

Size	Length 145 mm (excluding antenna) Diameter 12 mm (excluding parasol)
Weight	9 grams
Power	Internal rechargeable Lithium battery
Tether line	5 m, included on spool
Packing	Two sondes pack into a plastic tube 200 mm long, 32 mm diameter.

The sonde comes in three types:

- **Single-use** - Standard radiosonde
- **Reusable** - The sonde can be recovered and reused as it blinks brightly and beeps after landing, to aid in recovery. The software predicts the landing location.
- **Dropsonde** - Designed to be dropped from an airplane or UAV, it has an adjustable fall speed to measure with good vertical resolution during the fall

The firmware is upgradable.

Operation

Max altitude	10 000 m MSL
Sounding time (to 10 km)	At 3 m/s ascent speed: 56 minutes At 5 m/s ascent speed: 34 minutes
Battery life	3.5 h at 25 °C
Radio range (line-of-sight)	100 km (with standard option P13) 200 km (with option P20)
Sondes per frequency	3 (can be changed up to 120)
Fall speed	8 m/s at sea level *The fall speed can be customized*

Measurements – for all sensor options

The uncertainties given are standard combined uncertainty (k=1).

Sampling frequency (if using standard settings)

Temperature	1 Hz
Humidity	1 Hz
Pressure	⅓ Hz, interpolated to 1 Hz
Winds	1 Hz
Position	⅓ Hz
Light level	When the light level changes
Battery voltage	When the voltage changes

Pressure

Calibrated range	300 - 1200 hPa
Resolution	0.02 hPa
Uncertainty, in flight	≤ 0.5 hPa
Uncertainty, ground level [1]	≤ 0.5 hPa

Altitude

Resolution	1 m
Uncertainty, in flight [1]	7 m, assuming an accurate ground elevation figure
Uncertainty of GNSS-based altitude at ground level	7 m

The software reports geopotential height, calculated based on thermodynamics.
The unit is typically meters above mean sea level (“MSL”), though this is configurable.

[1] With calibration from ground station

Winds

	Wind speed	**Wind direction**
Range	0 - 102 m/s	0 - 360°, true or magnetic
Resolution	0.1 m/s	0.1°
Uncertainty	0.4 m/s	5° for wind speeds < 10 m/s, 2° for wind speeds > 10 m/s

Winds are calculated from GNSS.

Sensor option H3

	Temperature	**Humidity**
Measurement range	-55 °C ~ +60 °C	0 ~ 100 %RH
Resolution	0.01 °C	0.05 %RH
Uncertainty	0.5 °C with solar radiation correction.	5%RH for temperatures above -20 °C
Response time $T_{63\%}$	6 sec	< 8 sec at 25 °C Higher at low temperatures

Sensor option H4

	Temperature	**Humidity**
Measurement range	-30 °C ~ + 50 °C	0 ~ 100 %RH
Resolution	0.01 °C (capable of 0.002 °C)	0.01 %RH
Uncertainty	TBD (target 0.1 °C)	TBD (target 3 %RH)
Response time $T_{63\%}$	0.32 sec	0.5 sec at 25 °C

Telemetry

Frequency range	400 - 406 MHz or 433 - 436 MHz (programmable)
Range	Over 100 km with standard antenna and free line-of-sight
Power	Programmable up to 13 dBm (standard option P13) Programmable up to 20 dBm (Option P20)
Bandwidth	125 kHz
Simultaneous soundings	Configurable 1-126 sondes (the default setting is 3)
Modulation	LoRa modulation with configurable parameters
Regulations	License-free ISM band operation in EU. (Option P13) Complies with ETSI EN 302 054.

Cut-down

Reusable sondes and product options -C1 and -C2 can reliably detach from the tetherline under the following conditions:

Ambient temperature	> -20 °C
Battery charge level	> 3.54 V

The corresponding maximum altitude depends on the atmospheric conditions and the rise speed as dictated by the balloon and gas fill level.

Balloon

A latex balloon is included. For a slow ascent rate of 2 m/s, our recommendation is:

up to 5000 m	9 gram balloon (option B9)
5000-10000 m	20 gram balloon (option B20)

This table shows more combinations of target altitude and ascent rates:

Target				**Launch²**			**In Flight³**		
Alt. (m MSL)	**Ascent rate (m/s)**	**Mass (g)**	**Article Number**	**Diameter (cm)**	**Gas volume (L)**	**Neck lift (g)**	**Time to target alt. (min)**	**Burst diam.¹ (cm)**	**Burst alt. (m MSL)**
3000	2	9	BA9-2	39	30	*23*	24.4	50	7420
3000	3	20	BA20	55	87	*72*	16.3	71	7340
3000	4	30	BA30	78	251	*235*	12.2	95	5670
5000	2	9	BA9-2	39	30	*23*	40	50	7420



5000	3	20	BA20	55	87	*72*	26.7	71	7340
5000	4	30	BA30	78	251	*235*	20	95	5670
10000	2	20	BA20	44	44	*27*	51	71	12450
10000	3	30	BA30	58	104	*80*	51	95	12600
10000	4	50	BA50	82	293	*259*	38.3	120	10330
10000	5	100	BA100	92	412	*335*	30.6	185	16530

Interfaces

Port	**Purpose**
6-pin “SSP” port	Configuration, log readout, firmware upgrade, external sensors. External power and battery charging.
Internal I2C pins	Addons such as accelerometer
Internal mezzanine connector	H4 sensor and other addons using UART, I2C, SPI and/or GPIO

PC program

“Windsond Desktop”. Requirements: A 64-bit operating system and a x86-64 based CPU. Windows 10 or later. 1 GB free RAM. 120 MB free storage space. Linux support on request.

Optional features

- Onboard logging
- Reusable: Cut-down, speaker, bright LED, rechargeable battery
- Fast-response temperature and humidity sensor
- Accelerometer, gyro and compass
- External sensors

Article numbers

The base article number “S2” is followed by the sensor type, the sonde type and any options.
Sensor: H3 = standard sensor. H4 = fast-response sensor.
Sonde type: S = single-use. R = reusable. D = dropsonde.
Options: C1 = cut-down (implied for ‘R’ type)
Balloon type:

B0: No balloon
B9: 9 gram balloon
B20: 20 gram balloon
B30: 30 gram balloon
B50: 50 gram balloon

Examples

S2H3-R-B20: standard sensor, reusable. (Cut-down is included and implied), 20 gram balloon
S2H3-S-C1-B9: standard sensor, single-use, with cut-down, 9 gram balloon