iMet-54

1680MHz GPS Radiosonde Datasheet

This document serves to outline some key components, features and concepts used in the iMet-54 radiosonde - a leader in next-generation instrumentation for upper-air meteorology.

Temperature sensor

The iMet-54 utilises a glass bead thermistor for high-stability measurement of ambient air temperature. The small size results in a fast response time at all pressures. Aluminised coating of the sensor and support structures minimises the effects of short wave and long wave radiation heating of the sensor. An overall hydrophobic coating minimises the susceptibility to evaporative cooling that may occur above clouds.

Humidity sensor

The humidity sensor utilises thin-film polymer technology to offer rapid response measurements. This ensures detailed reporting of the humidity profile under all atmospheric conditions. The sensor includes a high-accuracy, embedded temperature element. Relative humidity may therefore be accurately reported for the ambient air conditions, irrespective of the influences of heating due to solar radiation. In addition, the effects of freezing and frost-forming atmospheric conditions are countered using effective, dynamic heating of the sensor.

Height and Pressure

Radiosonde height is provided by the integrated GNSS receiver. Multi-constellation operation ensures a quick position fix during preparation and accurate altitude reporting during the sounding. Pressure is derived from the reported altitude, combined with the temperature and humidity readings.

Winds

Wind speed and direction reporting during the sounding is derived from the GNSS position information. Processing algorithms ensure that wind vectors are not affected by swinging of the radiosonde beneath the balloon.

User interface

A single button provides power control as well as transmission frequency control. Indicators clearly show the chosen frequency, selected from a set of factory or user pre-defined channels. The indicators also confirm the unit's compliance during automatic start-up and operational built-in-tests.

Data Transmission

Packet transmission uses error correction techniques to ensure reliable, accurate data reception for all expected link conditions. Narrow band operation and the availability of precise transmission frequency selection permit maximum utilisation of the available meteorological frequency band. Data encryption may be implemented for enhanced security.

In-field configuration

The radiosonde may be optionally in-field configured directly from the D-Met sounding management software. Characteristics including transmission frequency, duration, altitude cut-off and the use of Xdata for third-party scientific instrumentation may be set up.

Calibration

Each iMet-54 radiosonde is individually calibrated for accurate temperature and humidity measurement. References used during the calibration are traceable back to national standards which realise the physical units of measurements according to the International System of Units (SI).

Key Features

- Humidity icing prevention
- Protection against evaporative cooling of temperature sensor
- Reliable telemetry link
- Compact, lightweight design
- Intuitive user interface
- Wireless configuration
- Xdata interface for 3rd party sensors
- SI traceable sensor calibration
- Low environmental impact

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1680MHz GPS Radiosonde Technical Data

General

Battery	Lithium
Operating time	> 180 min
Weight	80g
Dimensions (L x W x H)	235 x 70 x 30 mm
Calibration stability	2 years
Power / control	Wireless or push button

Telemetry

Transmission type	Synthesized
Maximum range [1]	> 250 km
Frequency band	1668.4 - 1690 Mhz
Frequency stability	< +/- 1 kHz
Deviation (peak to peak)	4.8 kHz
Output power	100 mW
Emission bandwidth	According to EN 302 454
Sideband radiation	According to EN 302 454
Modulation	GFSK
Data rate	4800 bit/s
Frequency selection	Wireless or push button
Push button frequencies	1676, 1678, 1680, 1682 MHz
Wireless frequency selection	1668.4 - 1690 MHz, 10 kHz resolution

GNSS Receiver

Number of channels	99
GNSS systems used	GPS + GLONASS + Galileo
Cold start acquisition time	35 s (nominal)
Reacquisition time	1 s (nominal)
Horizontal position accuracy	2.5 m (CEP)

Meteorological Sensors

Pressure

Type	GNSS derived
Range	1100 to 3 hPa
Resolution	0.01 hPa
Uncertainty	
1080 - 400 hPa	< 1 hPa
400 - 100 hPa	< 0.4 hPa
100 - 3 hPa	< 0.2 hPa
Reproducibility	
1080 - 400 hPa	< 0.6 hPa
400 - 100 hPa	< 0.3 hPa
100 - 3 hPa	< 0.2 hPa

Geopotential Height

Type	GNSS derived
Measurement range	0 to 50 km
Resolution	0.1 m
Uncertainty	< 8 m
Reproducibility	< 5 m

Wind

Type	GNSS derived
Wind speed range	0 to 180 m/s
Wind speed resolution	0.1 m/s
Wind speed uncertainty (RDF tracking mode)[2]	0.5 m/s
Wind speed uncertainty (GNSS mode)	< 0.15 m/s
Wind speed reproducibility	< 0.10 m/s
Wind direction range	0 to 360°
Wind direction resolution	0.01°
Wind direction uncertainty [3]	< 1°
Wind direction reproducibility	< 1°

Temperature

Type	Bead thermistor
Measurement range	-100 to +60 °C
Resolution	0.01 °C
Response time	
still air	< 2 s
6 m/s flow, 1000 hPa	< 0.5 s
Repeatability in calibration	< 0.1 °C
Uncertainty	
> 100 hPa	< 0.3 °C
< 100 hPa	< 0.5 °C
Reproducibility	
> 100 hPa	< 0.1 °C
< 100 hPa	< 0.25 °C

Humidity

Type	Capacitive Thin polymer
Range	0 to 100%RH
Resolution	0.01%
Response time	
6 m/s, 1000 hPa, +20 °C	< 0.4 s
6 m/s, 1000 hPa, 0 °C	< 1 s
6 m/s, 1000 hPa, - 20 °C	< 3.2 s
6 m/s, 1000 hPa, -40 °C	< 20 s
Repeatability in calibration	< 2% RH
Uncertainty	< 4% RH
Reproducibility	< 3% RH

Specifications subject to change without notice

The above performance figures reflect a 2-sigma (95%) confidence level, unless otherwise stated.

[1] Subject to balloon dimensions and atmospheric conditions

[2] For elevation angles > 15°

[3] For wind speeds > 3m/s

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