

MEMS Capacitive Accelerometers

# Preliminary Data sheet

## RS9010.A

30S.RS9X10.B.08.09

### Features

#### Tactical grade performance

- Bias stability down to <1.5mg for a  $\pm 10g$  sensor

#### Excellent vibration rectification coefficient

#### Very low intrinsic temperature sensitivity

#### Extra small packaging (LCC20, 8.9mm x 8.9mm)

#### Harsh environment (shock, vibration, temperature)

### Applications

#### Inertial sensing

→ RS9010.A is dedicated to AHRS applications and

#### low g IMU

IMU / AHRS for Mil/Aerospace

UAV

Land & Sea Inertial Navigation

### Description

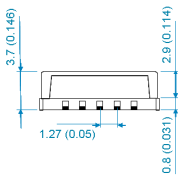
Colibrys RS9010 is the latest inertial product from the new IRIS™ family of MEMS capacitive accelerometer. This product is a major breakthrough toward advanced inertia and high stability measurements.

This generation of products comes either on a PCB board with all associated electronics components or in a LCC20 (8.9mm x 8.9mm) ceramic package.

The RS9010.A is an accelerometer based on a new MEMS

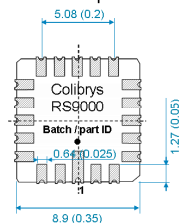
element, realized with the latest Colibrys technology and designed exclusively for high bias and scale factor stability, improved vibration rectification performance and enhanced temperature behaviour. RS9000 is interfaced with an open loop electronics, specifically designed for long term stability. This integrated electronics provide an acceleration-proportional output voltage as well as a temperature-proportional output voltage for further temperature compensations.

RS9000 side View

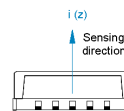


Typ. values mm (inch)

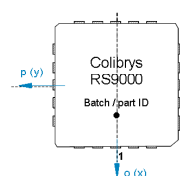
RS9000 top view



RS9000 side View



RS9000 top view



### Preliminary specifications

All values are specified between -55°C (-67°F) to +95°C (203°F) and at 5.0 VDC supply voltage, unless otherwise stated

|                                       | Units                         | RS9010.A                           |
|---------------------------------------|-------------------------------|------------------------------------|
| Input range                           | g                             | $\pm 10g$                          |
| Packaging                             |                               | PCB board or LCC20 (8.9mm x 8.9mm) |
| Bias @ 20°C                           | mg                            | < 50                               |
| One year composite repeatability      | $\mu g$ (1 $\sigma$ )         | < 1500                             |
| In run bias stability (48h) @ 20°C    | $\mu g$                       | < 350                              |
| Scale factor @ 20°C                   | mV/g                          | < 200 $\pm$ 2                      |
| One year composite repeatability      | ppm (1 $\sigma$ )             | < 300                              |
| Input axis misalignment (Kp, Ko)      | $\mu rad$                     | < 10'000                           |
| One year composite repeatability      | $\mu rad$                     | < 1000                             |
| Vibration rectification @ 20°C        | $\mu g/g^2$ rms (1 $\sigma$ ) | < 65 [50-500Hz]                    |
|                                       | $\mu g/g^2$ rms (1 $\sigma$ ) | < 65 [500-2000Hz]                  |
| Bandwidth@ 20°C                       | Hz                            | 500 $\pm$ 250                      |
| Noise spectral density in band @ 20°C | $\mu g/\sqrt{Hz}$             | 140                                |

### Environmental

### RS9010.A

|                             |   |
|-----------------------------|---|
| Operating temperature range | -55°C to +95°C (-67°F to 203°F)   |
| Reliability                 | Results based on MIL-HDBK-217, available on request.  |
| Shock                       | Specifications are valid up to 1'000 g (0.15ms half-sine period, shocks in each direction o, p, i)<br>Survivability of the product up to 4'000g (0.15ms half-sine period); no repeated shocks at this level |
| Recovery time               | < 1ms (1000g, half-sine period 1ms, shocks in direction i)  |
| Vibration                   | 20 g rms, 20-2000 Hz (random noise, 30 minutes in each direction o, p, i)   |
| LCC packaging               | The product has been qualified according to MIL-STD-883-E Hermetic sealing is qualified at 5·10 <sup>-8</sup> atm·cm <sup>3</sup> /s  |
| ESD sensitivity             | Class 2 (requirements MIL-STD-883-E, 1 Method 3015.7), HBM 2kV  |
| Proximity effect            | The sensor is sensitive to external parasitic capacitance. Proximity of large metallic mass (typ accelerometer size in mm ranges) must be avoided to insure best performances.                              |

Note: LCC must be tightly fixed to the PCB, using the bottom of the housing as reference plan for axis alignment.

### Electrical

### RS9010.A

|  |   |
|--|---|
| Input voltage (VDD – VSS)                  | 2.5 to 5.5 VDC. The standard voltage for calibration is 5.0 VDC.  |
| Output voltage range                       | From 0.5 to 4.5 VDC @ 5.0 VDC input voltage (2.5 V ± 10 mV at 0 g)  |
| Operating current consumption              | < 700 µA @ 5.0 VDC  |
| Initialization & reset current consumption | Typ. 1800 µA @ 5.0 VDC during the initialization phase (less than 35 ms at room temperature)  |
| Reset                                      | The sensor is Brown out protected. A reset occurs when the power supply jumps more than +0.46 V with a slope >380V/s or if the power supply drops below 2.2V. The recovery time is typ. 25 ms (max 35 ms) |
| Output impedance / load                    | Min. 50 kΩ at Vout (pin 8) and VAGND (pin 5)<br>Max. 50 pF at Vout (pin 8) and Max. 100 µF at VAGND (pin 5)   |

### Physical

Hermetically sealed LCC, 20 pins housing

|        |  |
|--------|--|
| Weight | < 0.6 grams  |
| Size   | Typ. 8.9 x 8.9 x 3.70 mm (0.35 x 0.35 x 0.146 inch)<br>Max. 9.2 x 9.2 x 3.98 mm (0.354 x 0.354 x 0.157 inch) |

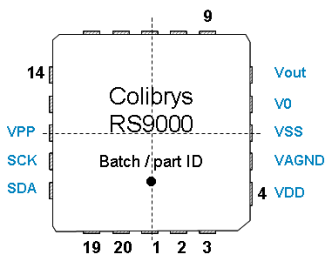
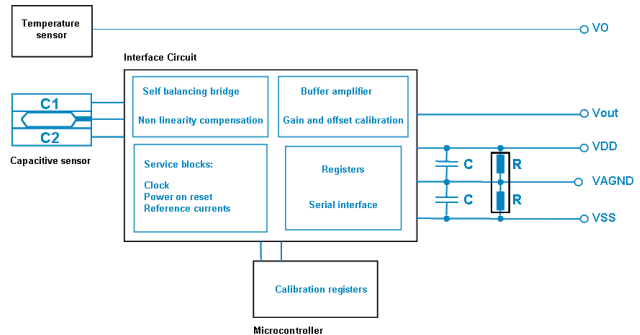
### Temperature sensor:

|                        |  |
|------------------------|--|
| Output Voltage at 20°C | Typ: 1.632 V                           |
| Sensitivity            | Typ: -11.77 mV/°C                      |
| Long term stability    | Max -0.03°C to +0.09°C (1000h @ 150°C) |
| Accuracy               | ± 5°C (From -55°C to 125°C)            |

### Block diagram and electrical connections

It is mandatory to implement two very high precision matched resistors [R] of 10 kΩ each outside the LCC package, as close as possible to the accelerometer between VDD and VAGND and between VSS and VAGND. This ultra-high precision resistive divider is used as internal reference voltage by the interface circuit. More precise information is available on the dedicated application note "VAGND Reference on RS9000" (30VAGND.MS9X.x.xx.xx)

It is also necessary to use decoupling capacitors [C] of 1µF each between VDD and VAGND and between VAGND and VSS, placed also as close as possible from the accelerometer. COG or X7R @ 5% capacitor types are recommended.



| Pin | Description                             | Remarks                                |
|-----|---|--|
| 4   | VDD                                     | Power supply                           |
| 5   | VAGND                                   | Accelerometer output reference voltage |
| 6   | VSS                                     | Ground                                 |
| 7   | V0                                      | Temperature sensor output              |
| 8   | Vout                                    | Accelerometer output signal            |
| 16  | VPP (Colibrys internal calibration pin) | <b>Must</b> be connected to VSS        |
| 17  | SCK (Colibrys internal calibration pin) | <b>Must</b> be connected to VSS        |
| 18  | SDA (Colibrys internal calibration pin) | <b>Must</b> be connected to VSS        |

A detailed RS9000 Product Description (30D.RS9X.x.xx.xx) and further Application Notes are available on demand or on our web site.

In order to provide an ideal support to our customers, our

new RS9000 products will be available worldwide through a wide network of distributors and agents or directly at Colibrys. Do not hesitate to access our web site for precise references or contact directly Colibrys in Europe or in US for more details.