

# AQG-B

## Absolute Quantum Gravimeter for outdoor applications

The AQG is an absolute gravimeter based on quantum technologies and atom-light interactions, offering unparalleled measurement performance of  $10 \text{ nm/s}^2$ . Using laser-cooled atoms as a free-falling test mass in a vacuum, it enables self-referencing. Since 2015, the AQG has been the first commercially available gravimeter utilizing quantum technology. Built on atom interferometry principles, approved by the International Bureau of Weights and Measures (BIPM), the AQG sets the standard in high-precision traceable gravitational measurements. Its built-in design allows for easy deployment without requiring any knowledge in quantum physics.



### FEATURES

- Absolute gravity measurement at a level of  $10 \text{ nm/s}^2$  in terms of sensitivity and stability
- Continuous data acquisition from a few seconds to several years
- Transportable device, easy and fast to operate
- Full remote control and support / monitoring capacity
- Low maintenance (no moving parts, no gasket or belt to replace / no vacuum or mechanical parts to replace)
- Off-power transport and storage possible for several weeks

### BENEFITS

- Fibered components no optical alignment required
- No alignment procedure
- Extreme compacity
- Excellent robustness to ground vibrations
- High reliability (lifetime > 50,000 hours)
- Sensor head can be moved within a 15 m radius without moving supply rack

### APPLICATIONS

- Natural resources management
- Geodesy
- Volcanology
- Metrology
- Subsurface imaging



Easy cable management



15 m long cable



< 10 connectors



User friendly interface

TECHNICAL SPECIFICATIONS

Performance

|                                   |                                                                                                                                                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Typical Precision at a quiet site | 500 nm/s <sup>2</sup> /sqrt(t) <sup>(1)(2)</sup><br>50 nm/s <sup>2</sup> in 1,5 min<br>20 nm/s <sup>2</sup> in 10 min<br>10 nm/s <sup>2</sup> in 40 min |
| Long-term stability               | ≤ 20 nm/s <sup>2</sup>                                                                                                                                  |
| Trueness                          | ≤ 150 nm/s <sup>2</sup> <sup>(3)</sup>                                                                                                                  |
| Repeatability                     | ≤ 50 nm/s <sup>2</sup>                                                                                                                                  |
| Cycling frequency                 | 1.85 Hz                                                                                                                                                 |

Physics package

|                                                            |                                                           |
|------------------------------------------------------------|-----------------------------------------------------------|
| Number of boxes                                            | 5                                                         |
| Maximum mass of each box                                   | 40 kg                                                     |
| Dimensions of sensor head                                  | 1 module: Diameter 40 cm x Height 100 cm / (tripod incl.) |
| Dimensions of control unit                                 | 2 modules: Height 41 cm x Width 59 cm x Length 105 cm     |
| Warm up time (typical) / Start & stop function             | 2 hours / enabling rapid setup once warmed-up             |
| Length of the cable between sensor head and laser system   | 15 m                                                      |
| Obeservation time to achieve 10nm/s <sup>2</sup> precision | 2 hours                                                   |

System Interface & Control

|                               |                                                                                                          |
|-------------------------------|----------------------------------------------------------------------------------------------------------|
| Control system                | External computer (Linux OS)                                                                             |
| User Interface                | Dedicated software                                                                                       |
| Remote Control and Monitoring | With TeamViewer                                                                                          |
| Data format                   | .csv (All corrections (tides, ocean loading, atmospheric pressure) are recorded for easy post-processing |

Operating conditions

|                                             |                           |
|---------------------------------------------|---------------------------|
| Operating Temperature / Storage temperature | [0 ; 40] °C / [5 ; 30] °C |
| Humidity                                    | 60%                       |
| Operating Voltage                           | 110 V/230 V               |
| Operating power consumption                 | 500 W                     |

(1) Guaranteed Precision measured @ Exail premises: 800 nm/s<sup>2</sup>/ Typical Precision measured @ quite site 500 nm/s<sup>2</sup>  
(2) Allan deviation with a white-noise behavior of 500 nm/s<sup>2</sup>/sqrt(Tau) or below between 50 and 600 s integration time  
(3) By measurement / Error budget characterized at Exail premises prior to shipment and corresponding accuracy table delivered with the test report

