

Our World is **Magnetic.**

**GEM's Optically Pumped Potassium GSMP-35A is the most advanced Airborne Sensor today.**

**It offers a number of benefits for towed and fixed wing configurations, including:**

Highest sensitivity in all weather conditions for enhanced resolution of geological and cultural features in a variety of applications

Highest absolute accuracy (varying by no more than +/- 0.05 nT between sensors)

Fast sampling rate of 20 Hz

VLF-EM Option available

Insensitive to microphonics

Low maintenance (no re-alignments)

Complete Systems are available:

- Bird
- Radar Altimeter
- GPS (20 Hz)
- Data Acquisition

Advanced base stations:

- GSM-19W Overhauser
- GSMP-35 Potassium

**All of these technologies come complete with an industry leading two-year warranty.**



**Magnetometer GSMP-35A(B), Vertical Gradiometer GSMP-35GA(B), and Tri-Axial Gradiometer GSMP-35GA3(B)**

(based on the latest GSMP-35A v8.0 high resolution airborne sensor)

The worldwide application of airborne magnetic and gradiometric data is growing - driven by the increasing demand for high-resolution data for mineral and oil exploration, UXO, and other requirements.

Major industry requirements for airborne mapping include durability, accuracy, and sensitivity.

GEM is pleased to offer a family of magnetic-based solutions featuring the highest resolution magnetometer / gradiometer airborne system available.

Standard configurations in GEM's family include:

- Airborne Magnetometers
- Vertical and Horizontal Gradiometers
- Tri-Axial Gradiometers

GEM also offers complete configurations of airborne solutions, such as:

- Bird
- Radar Altimeter
- GPS
- Data Acquisition
- Installation assistance

Along with these configurations, GEM supports both fixed-wing and helicopter applications with a range of systems already implemented.

*"We were very impressed with the airborne equipment and how well it performed; You have designed and built a great piece of equipment!"*

*Alan Davies, P.Eng., V.P. Exploration, Talmora Diamond Inc.*

### Airborne Magnetometer Effect

The GSMP-35A magnetometer is the core of GEM's airborne solutions. The technology is based on a unique optically pumped Potassium sensor - offering an order-of magnitude increase in resolution over other systems. It also provides:

- Minimal "heading" errors
- Highest absolute accuracy
- Decreased maintenance costs

These advantages - plus GEM's reputation as a proven supplier of advanced technologies - make the GSMP-35A a key solution to consider for your next airborne installation.

### Key Components

GSMP technology comprises of:

- Sensor head
- Radio Frequency (RF) pre-amplifier and drive electronics module / processor
- Cable (1 to 10m - standard 5m) to separate sensor and electronics for noise elimination
- Optional signal processor / console and cable

This sensor may deploy as a single unit or in combination with other sensors.

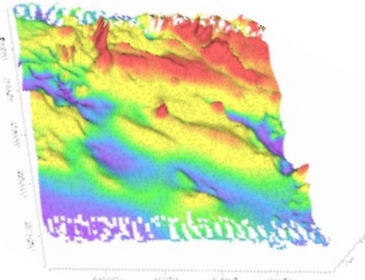
## Vertical / Horizontal Gradiometer

Benefits of Gradiometers:

- Freedom from diurnal effects and noise
- "Real" analytic signal computed from measured gradients which can be used for more accurate track positioning
- Improved definition of structures that are non parallel to survey lines.

GEM's vertical and horizontal gradiometers are designed to fit the requirements of those needing high sensitivity and high accuracy magnetic results.

## Tri-Axial Magnetic Gradiometer



GEM's Tri-Axial Gradiometer was the world's first 4-sensor gradiometer developed in the early 1980's using Overhauser technology. In this configuration, four Potassium units are installed in a special "bird". The 4 sensors define a tetrahedron, allowing for measurement of the Total Magnetic Field and the gradients in three directions:

- Vertical gradient
- Horizontal gradient (along-the-track)
- Horizontal gradient (across-the-track)

The same gradients in 3 directions can be determined with only 3 sensors, if consecutive sensor readings are used to calculate the along-the-track gradient.

Horizontal gradient measurements are increasingly popular for providing details about the lateral extent of subsurface anomalies located between survey lines. Vertical gradients can assist significantly in identifying geologic / structural contacts and near-surface targets (such as UXO).

Other benefits include:

- Providing a very stable and noise-free platform for acquiring high resolution data
- Delivers information for reducing any positioning errors using onboard GPS, and no magnetic compensation required

## Airborne Base Station Configurations

Another area of application for GEM's magnetometers is in airborne base station monitoring. Customers have the choice of working with GSMP-35A or GSM-19W (Overhauser).

The GSMP-35A implementation offers advantages for surveys where very high resolution diurnal corrections are needed. GSM-19W implementations deliver good resolution and economical pricing.

Both implementations share a number of advanced features (introduced in GEM's v7.0 firmware release), including:

- Precise time synchronization of field and base station units using a built-in GPS option. This capability is particularly important for working in noisy magnetic conditions and provides the highest accuracy possible
- Flexible scheduling (up to 30 on / off periods), by simply defining a series of intervals and the base station will turn itself on as you need. This mode provides the greatest flexibility for longer surveys where leaving your base station on increases efficiency. Immediate start and daily modes are also provided.

## Benefitting from the Natural Properties of Potassium Optical Pumping

Experienced in Potassium technologies, GEM feels confident that your next survey will benefit in many ways, including acquisition of:

- Highest sensitivity data (reflecting Potassium spectrum characteristics and high natural frequency of 7 Hz/nT)
- Highest absolute accuracy (a variation of only +/- 0.05 nT between sensors makes the GSMP-35A an ideal choice for gradiometer installations)
- Data with minimal heading errors (reflecting the insensitivity of Potassium to aircraft / bird orientation)
- Data that is not affected by phonics (low frequency vibration in the audio range).

As well, maintenance costs are minimal in comparison with other systems as key components can be replaced in the field.

## Specifications

### Performance

Sensitivity: 0.0003 nT @ 1 Hz\*  
Resolution: 0.0001 nT  
Absolute Accuracy: +/- 0.05 nT  
Range: 15,000 to 120,000 nT  
Gradient Tolerance: 50,000 nT/m  
Samples at: 1, 5, 10, 20 Hz\*\*  
*\*(optional 0.0001 nT @ 1 Hz GSMP-30A)*  
*\*\*\*(optional up to 1000Hz)*

### Orientation

Sensor Angle: Optimum angle 30° between sensor head axis & field vector  
Orientation: 10° to 80° & 100° to 170°  
Heading Error: +/- 0.05 nT @ 360° full rotation about axis

### Environmental

Operating Temperature: -40°C to +55°C  
Storage Temperature: -70°C to +55°C  
Humidity: 0 to 100%, splashproof

### Dimensions and Weights

Sensor: 148mm x 64mm (cylinder type); 1 kg  
Electronics Box: 229mm x 56mm x 39mm; 0.63 kg

### Power

Power Supply: 22 to 32 V DC  
Power Consumption: 0.5 amp typical at 20°C  
Warm-up time: <10 minutes at 20°C

### Outputs

20Hz RS-232 output with comprehensive Windows Personal Computer (PC) software for data acquisition and display

Outputs UTC time, magnetic field, lock indication, heater, field reversal, position (latitude, longitude, or UTM), GPS altitude, number of satellites, and differential GPS

### Components

Sensor, pre-amplifier box, 5m sensor / pre-amplifier cable, manual, and shipping case

**GEM**  
SYSTEMS  
ADVANCED MAGNETOMETERS

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