WALKER LDJ SCIENTIFIC, INC.

WALKER – SINCE 1896 – OVER A CENTURY OF QUALITY

Fluxgate Magnetometers

FGM SERIES SINGLE AXIS • TRIAXIAL

BBM-BROADBAND AC MAGNETOMETERS

Fluxgate Magnetometers

TRIAXIAL MODEL FGM-5DTAA

SINGLE AXIS MODEL FGM-3D2

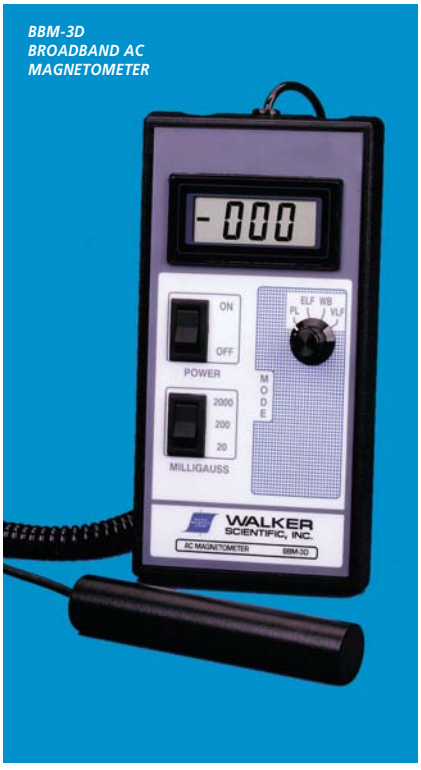
GENERAL:

Walker LDJ Scientific, Inc. provides the most comprehensive selection of instruments that precisely measure DC to 50 kHz magnetic fields from 0.01 mG to 2000 mG.

The **FGM Series Fluxgate Magnetometers** consists of ten models – eight single axis and two triaxial. The **Single Axis Instruments** combine the convenience of hand held portability with high sensitivity and accuracy. DC magnetic fields can be measured to an absolute accuracy of ± 0.5% traceable to NIST with linearity of better than 0.02% in all ranges and resolution down to 0.01 mG in the 20 mG range. The optional neutralization feature can be used to offset ambient fields up to 600 mG, thus allowing precise measurements of very small magnetic field changes in the presence of larger fields, such as the Earth's field. All models provide a buffered analog output, DC to 100 Hz (optional DC to 400 Hz).

The **Triaxial Fluxgate Magnetometers** measure the three vectors of the magnetic field simultaneously and have the capability of displaying individual vectors or the resultant vector and its direction with a range up to 2000 milligauss. Both models feature ± 0.5%, ± 1 count accuracy traceable to NIST, provide 0.01 milligauss resolution and linearity of ± 0.2%. In the relative mode the FGM-5DTAA offers accuracy of ± .25% of the reading taken. They have a DC to 100 Hz frequency response and noise level of <0.5 gamma. Both instruments offer a buffered voltage analog output capable of driving a strip chart or data acquisition system. Data storage, data acquisition and remote control through an RS 232 interface is also available.

The **BBM Broadband AC Magnetometer** also offers the convenience of hand held portability with high sensitivity and accuracy. AC magnetic fields from 0.01 milligauss to 2.0 gauss up to 50 kHz can be measured to an absolute accuracy of ± 1.0% traceable to NIST with linearity of better than 0.02% in all ranges and resolution down to 0.01 mG. Four frequency ranges can be selected (power line, ELF, VLF and WB) and two analog outputs, RMS and wideband, are provided for data recording and analysis.



BBM-3D BROADBAND AC MAGNETOMETER

FGM Single Axis Fluxgate Magnetometers

FEATURES:

- Portable, battery powered magnetometer
- 1 gamma (.01 milligauss) resolution on 20 milligauss range
- ± 0.5% absolute accuracy traceable to NIST (Previously NBS)
- Three full scale ranges: ± 20, ± 200, and ± 2000 milligauss
- 3 1/2 or 4 1/2 digit display
- Analog output ± 2 volts
- Noise < 0.5 gamma
- Wide bandwidth 100 Hz or 400 Hz
- Neutralization feature ± 600 milligauss
- CE Certified

APPLICATIONS:

- Package inspection
- Classroom demonstrations
- Residual field measurements (shielding effectiveness)
- Solenoid/Helmholtz coil calibration
- Field Mapping
- Vehicle magnetic signature measurements
- Measure Earth's field vector components
- Magnetic environment monitoring
- Measure weak fields in rocks

FGM-3D2L HAND-HELD FLUXGATE MAGNETOMETER


MODEL FGM-3D2TN with CASE and AC ADAPTOR

The CE certified FGM series of single axis fluxgate magnetometers are rugged, accurate, highly sensitive portable hand-held instruments which can measure DC magnetic fields from 1 gamma (1nTesla) to 2 gauss.

These small and highly stable portable instruments, powered by a conventional 9 volt alkaline battery, can measure DC magnetic fields to an absolute accuracy of ± 0.5% traceable to NIST, with linearity better than ± 0.02% on all ranges.

The full scale ranges include ± 20 milligauss, ± 200 milligauss, and ± 2000 milligauss. The 3 1/2 digit LCD display (or optional 4 1/2 digit display), provides a resolution of 0.05% (1 gamma on the 20 milligauss range).

There are no zero or gain adjustments required. The fluxgate magnetometer design inherently results in very stable and accurate performance.

A buffered analog output is provided which can be used to drive a strip chart recorder or connect to a data acquisition system. The wide frequency response of DC to 100 Hz (optional DC to 400 Hz) of the analog output allows the user to monitor fast moving magnetic signals and measure 50/60 Hz powerline fields.

Typical applications include measuring the ambient field, inspecting air shipment packages for compliance with FAA regulations (or IATA), classroom demonstrations, calibrating laboratory field sources such as solenoids or Helmholtz coils, measuring weak fields in rocks, mapping and recording field perturbations caused by ferromagnetic objects (e.g. vehicles), measuring Earth's field vector components, determining attenuation characteristics of magnetic shields and shielding materials, and evaluating effectiveness of magnetically shielded rooms.

The superior stability, linearity, and accuracy of the FGM compared to Hall effect devices make it the only choice for precision high quality low level magnetic field measurement and the best choice for general purpose magnetometer applications.

The FGM comes with either a longitudinal (L) or transverse (T) sensor. A neutralization (N) feature is also available. This feature permits the user to null out the effects of the earth's field or ambient fields from 0 to ± 600 milligauss when conducting measurements outside of a shielded enclosure.

SINGLE AXIS SPECIFICATIONS*

MODEL NO.	FGM-3D2L	FGM-3D2T	FGM-4D2L	FGM-4D2T	FGM-3D2LN	FGM-3D2TN	FGM-4D2LN	FGM-4D2TN
RANGES	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT	± 20 mG-2µT ± 200 mG-20µT ± 2000 mG-200µT
BANDWIDTH	DC to 100 Hz	DC to 100 Hz	DC to 400 Hz	DC to 400 Hz	DC to 100 Hz	DC to 100 Hz	DC to 400 Hz	DC to 400 Hz
DIGITAL DISPLAY	3 1/2 digits	3 1/2 digits	4 1/2 digits	4 1/2 digits	3 1/2 digits	3 1/2 digits	4 1/2 digits	4 1/2 digits
RESOLUTION	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range	1nT/0.01 mG on 20 mG Range
ACCURACY	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count	± 0.5% of FS, ± 1 Count
NEUT. OPTION	NO	NO	NO	NO	± 600 MG	± 600 MG	± 600 MG	± 600 MG

* *The following features and specifications apply to all single axis models:* ***Power Source****: 9V battery;* ***Low Battery Indicator****: Yes;* ***Analog Output****: ± 2V;* ***Temperature Range****: 0° C to 50° C;* ***Power Consumption****: 150 mW;* ***Optional AC Adaptor****: Yes;* ***Probe Dimensions****: 2.75" L x 1.13" W x 0.62" H;* ***Probe Cable Length****: 5' (1.52 meters);* ***Weight****: 15 oz.;* ***Carrying Case****: Included;* ***Case Dimensions****: 7.5" L x 4.0" W x 1.80" H;* ***CE Mark****: Yes;* ***Certified & NIST Traceable****: Yes;* ***Warranty****: One Year*

KEY TO PRODUCT CODE:
FGM (Fluxgate Magnetometer), **3** (3 1/2 Digit Display), **4** (4 1/2 Digit Display), **D** (Digital Display), **2** (FGM Series), **L** (Longitudinal [axial] Probe), **T** (Transverse Probe), **N** (Neutralization [nulling] Feature

FGM Triaxial Fluxgate Magnetometers

The **FGM-4DTAM Triaxial Magnetometer** is a sophisticated and very accurate instrument. The 4 1/2 digit display permits resolution of 0.1 milligauss (0.01µT) in a 1999.9 milligauss (199.9 µT) field.

In addition to its high degree of accuracy, it is simple and easy to operate. There are no adjustments to make. Just turn on the power, select the display units that you prefer (milligauss or microtesla) and select the magnetic field vector (X, Y or Z).

The FGM-4DTAM's sensor simultaneously measures the three magnetic field vectors in the rectangular coordinate system. The vector component selected manually is displayed on the instrument's LCD. Each of the X, Y, and Z components are available at all times through the analog output.

FEATURES:

- Portable, hand held and battery operated
- Continuous measurement of the x, y and z axes
- Displays read in milligauss, nanotesla, or microtesla
- Analog output allows monitoring of all three axes simultaneously
- The RS 232 connection on the FGM-5DTAA allows remote control and monitoring
- The FGM-5DTAA also has field nulling, internal data storage and resultant vector calculation capabilities
- Accuracy of ± 0.25% traceable to NIST
- Band width response DC to 100 Hz

GENERAL SPECIFICATIONS*

	FGM-4DTAM	FGM-5DTAA
POWER	One nine volt battery. Nominal operating power consumption is 153 mW	Two nine volt batteries. Nominal operating power consumption is 550 mW; when powered down 20 mW
OPERATING TIME	Thirty hours continuous operation with a 9V Alkaline battery	Twenty-four hours continuous operation with Lithium batteries
DISPLAY	4 1/2 digit LCD with low battery indicator	Two lines by sixteen characters LCD. Viewing area dimensions are 89.4 mm L x 13.7 mm H x (3.54" L x 0.54" H)
ANALOG OUTPUT	± 2.0 V DC 5 pin microdin connector	± 2.5 V DC 8 pin minidin connector

** The following features and specifications apply to both triaxial models:* ***Temperature Range****: 0° C to 50° C;* ***Power Consumption****: 150 mW;* ***Optional AC Adaptor****: Yes;* ***Probe Size****: 25.4 mm W x 25.4 mm H x 100.6 mm L (1" W x 1" H x 4" L);* ***Probe Cable Length:*** *7' (2.13 meters) standard. Optional lengths up to 30.5 meters (100');* ***Weight:*** *0.539 kg (1.2 lb.) including sensor;* ***Carrying Case****: Included;* ***Case Size****: 100.1 mm W x 39.9 mm H x 196.1 mm L (4" W x 1.3" H x 7.5" L);* ***Units:*** *mG, µT*

FGM Triaxial Fluxgate Magnetometers

FGM-5DTAA

The **FGM-5DTAA Triaxial Magnetometer** is a highly accurate instrument which uses fluxgate technology to measure the three vector components of the magnetic field.

The FGM-5DTAA combines high resolution, accuracy and linearity with the convenience of a portable hand held instrument. It has been designed specifically for measuring weak magnetic fields. The 5 digit display permits resolution of 0.01 milligauss (0.001µT) in a 1000 milligauss (100 µT) field with accuracy of ± 0.25% traceable to NIST. In the relative mode, small variations in magnetic fields can be precisely measured in the presence of a large field such as the Earth's magnetic field.

Special features of the FGM-5DTAA are described on the next page.

TECHNICAL SPECIFICATIONS

	FGM-4DTAM	FGM-5DTAA			
COMPONENT	X, Y, or Z	X, Y, or Z	R	D[2]	I[3]
RANGE	± 2000 mG - 200µT	± 1000 mG - 100µT	± 1732 mG - 173µT	± 180 degrees	± 90 degrees
RESOLUTION	0.1 mG - 0.01µT	0.01 mG - 1nT	0.01 mG - 1nT	0.01 degrees	0.1 degrees
ACCURACY ABSOLUTE[1] RELATIVE[1]	± 0.5% F.S., ± 1 count N/A	± (0.25% of reading + 20nT) ± 0.25% of reading	± (0.5% of reading + 20nT) ± 0.5% of reading	1 degree 1 degree	1 degree 1 degree
ANGULAR ALIGNMENT	± 3.0 degrees	—	—	See above	See above
FREQUENCY RESPONSE	DC - 100 Hz	DC - 100 Hz	DC - 100 Hz	N/A	N/A
LINEARITY	± 0.02% FS	± 0.02% FS	± 0.02% FS	—	—

APPLICATIONS

- Evaluate Shielding Effectiveness
- Measure Magnetic Signature of Vehicles
- Inspect Packages
- Monitor Magnetic Environments
- Calibration and Control of Helmholtz Coils & Solenoids
- Measure Earth's Field Vector Components
- Field Mapping

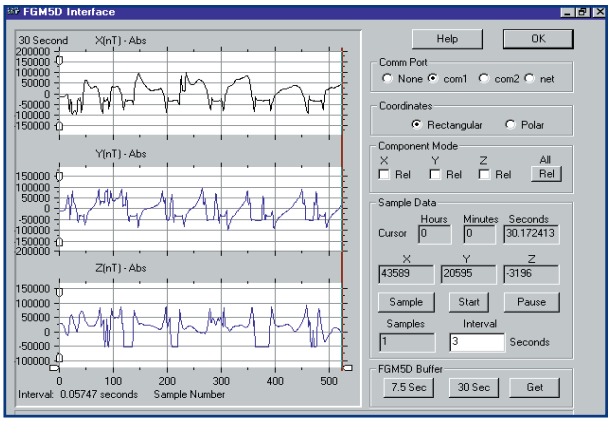
FGM-5DTAA SPECIAL FEATURES

In addition to its high level of accuracy, the FGM-5DTAA has a number of unique and special features.

- **Two vector representation** allows the user to display either the rectangular (X, Y, Z) or polar (R, D, I) components of the magnetic field. The polar representation is convenientfor measuring the magnitude and direction of the field. No manual calculations required
- The field magnitude can be displayed in one of **three common units**; nanotesla (nT), microtesla (T), or milligauss (mG).
- The **Relative Display Mode** permits measurement of changes in magnetic fields from an initial value.
- **Multiple analog outputs** make the raw analog magnetometer signal as well as the processed signal available for recording or further processing through an 8 pin microDIN connector. The raw signals are useful for wide band AC field measurements. The processed signal outputs match the selected vector representation values and can be set to one of eight gain levels to provide higher output voltage resolution as required.

DATA STORAGE

PARAMETER	SNAPSHOT	RECORD	MANUAL
Number of points:	525	525	525
Duration:	7.5 seconds	30 seconds	User determined
Sample Rate:	69.5 samples/second	17.4 samples/second	User determined
Serial Port:	Three wire RS232 port operating at 9600 baud, one start bit, one stop bit and no parity.		
Angular Alignment:	The X and Y axes sensors are aligned parallel to the base surface and along its length and width edges, respectively, to within ± 0.25 degrees. The Z axis sensor is aligned normal to the base surface within ± 0.25 degrees. This sensor arrangement represents a right-handed coordinate system.		



FGM-5DTAA INTERFACE PROGRAM

The FGM-5DTAA Interface Program is a convenient way to control a locally connected FGM-5DTAA Triaxial Fluxgate Magnetometer through an RS232 serial communications port of an IBM compatible personal computer (PC) or with a remote FGM-5DTAA over a network. The program runs under either Microsoft Windows 95/98 or Windows NT 4.0 operating systems.

With a serial port connection, the FGM-5DTAA Interface can be used to:

- Set the measurement coordinates to Rectangular or Polar
- Set the measurement mode of each vector component to Absolute or Relative
- Acquire and display a single reading or three vector components
- Activate one of the FGM-5DTAA recording functions (Snapshot or Record)
- Download the recorded data stored in the FGM-5DTAA data buffer and display it on the strip chart
- Perform a strip chart recording of the FGM-5DTAA readings at a user selectable sample interval
- Print the strip chart
- Save downloaded or strip chart data on disk in a spreadsheet compatible format
- Retrieve and display previously saved data
- Record and later display manual data

The strip chart Save, Load and Print functions are available through a menu that pops up when the right mouse button is pressed.

With a network connection, the FGM-5DTAA Interface can be used to:

- Download data stored in a buffer by the remote FGM-5DTAA network server
- Download data files logged by the remote FGM-5DTAA server
- Download the most recent reading taken by the remote FGM-5DTAA
- Strip chart data as it is being acquired by the remote FGM-5DTAA

ANALOG OUTPUTS

PARAMETER	DAC OUTPUT	ANALOG MAGNETOMETER
Number:	3[1]	3[2]
Gains:	1,2,4,8,16,32,64,128	None
Voltage Range:	± 2.5 volts	± 2.5 volts
Scale Factor:	24.41 x gain µ V/nT	24.41 µ V/nT
Accuracy:	± 1% of full scale	± 5% of full scale
Resolution:	12 bits	Not applicable
Zero Field Output:	0 ± 5 mV	0 ± 5 mV
Frequency Response:	DC to 10 Hz nominal	DC to > 100 Hz

[1] *Corresponds to actual or relative values based on the selected mode and coordinates.*
[2] *Corresponds to the actual rectangular component values.*

BBM Broadband AC Magnetometers

Walker LDJ Scientific, Inc. also provides a broadband AC Magnetometer that allows precise measurement of AC fields up to 50 kHz from 0.01 mG to 2000 mG.

FEATURES:

- 31/2 digit LCD Display
- Three position range switch
  ± 20 mG; ± 200 mG; ± 2000 mG
- Four position frequency selection switch;
  PL, ELF, VLF, WB
- Power line field, RMS analog output
- Wideband analog output
- Probe separate from display
- NIST traceable certification
- CE Certified

APPLICATIONS:

- Power line field surveys
- VDT field measurements
- Power line field monitoring
- Power line harmonic analysis
- Industrial equipment field measurement
- Electrical appliance field measurement
- General purpose wideband ELF/VLF measurements & spectrum analysis

BBM-3D BROADBAND AC MAGNETOMETER WITH CARRYING CASE

The CE certified BBM-3D is a wide band, high sensitivity general purpose AC magnetometer designed for precision measurements of AC magnetic fields generated by power lines, substations, transformers, motors, CRT's, industrial equipment and any electrical appliance. It identifies and monitors radiation levels from virtually any source.

The BBM-3D incorporates a high grade filtered induction coil sensor that eliminates error caused by sensor movement within the earth's magnetic field. This quality instrument provides reading accuracy of ±1% traceable to NIST with a precision of .01 milligauss.

Two analog output connections are provided for those applications where a LCD readout is not sufficient. The RMS value is available for connection to a strip chart recorder or DAS. A wideband connection (12 Hz to 50 kHz) provides a signal for an oscilloscope, waveform recorder, DAS or spectrum analyzer.

The superior sensitivity, accuracy, wideband performance, and convenience of use in power line and appliance field measurements make the BBM-3D the instrument of choice for extremely low, AC magnetic field measurement.

BBM-3D BROADBAND AC MAGNETOMETER

GENERAL SPECIFICATIONS

Range:
± 20 mG-2µT
± 200 mG-20µT
± 200 mG-200µT

Bandwidth:
4 Bands to 50 kHz

Digital Display:
3 1/2 Digits

Resolution:
1 nT/0.01 mG on
20 mG Range

Low Battery Indicator:
Yes

Accuracy:
± 1% of RDG
+ 1 Count

Analog Output:
RMS-200mVFS
Video-3V Peak to Peak

Temperature Range:
0° C. to 50° C.

Neut. Option:
No

Power Source:
9V Battery

Power Consumption:
22.5 mW

Optional AC Adaptor:
No

Probe Dimensions:
4.80" L x 0.90" D

Probe Cable Length:
5' (1.52 meters)

Case Dimensions:
7.5" L x 4.0" W x 1.8" H

Weight:
15 oz.

Carrying Case:
Included

CE Mark:
Yes

Certified & NIST Traceable:
Yes

Warranty:
1 Year

WALKER – SINCE 1896 – OVER A CENTURY OF QUALITY

Rockdale Street • Worcester, MA 01606 U.S.A.
(508) 852-3674 • (508) 853-3232
Toll Free 1 (800) 962-4638 • Fax (508) 856-9931
Email: info@walkerldjscientific.com
Website: www.walkerldjscientific.com