MEDA, Inc.
Macintyre Electronic Design Associates, Inc.

HKMedOC
Wellcome Technology Co., Limited

FVM-400 Handheld Vector Fluxgate Magnetometer



- **High resolution measurements: 1 nT in 100,000 nT field**
- **±0.25% basic accuracy**
- **Choice of display units: nT, μT or mG**
- **Three vector components simultaneously displayed on screen**
- **Vector components displayed as rectangular or polar coordinates**
- **Absolute or relative display modes**
- **Six analog output signals**
- **Three data recording modes**
- **Remote RS232 operation**

The FVM-400 Vector Fluxgate Magnetometer is a precision instrument for measuring magnetic field vectors. Its small size and portability make it ideal for field and laboratory applications.

High Resolution

The 5 digit display permits resolution of 1 nT in a 100,000 nT field. Thus small variations in magnetic field can be measured in the presence of a large field such as Earth's magnetic field.

Two Vector Representations

The user can display either the rectangular (X, Y, Z) or polar (R, D, I) components of the magnetic field. The polar representation is particularly convenient for measuring the magnitude and direction of the field. No manual calculations are required.

Selectable Units

The user can display the field magnitude in one of three common units: nanotesla (nT), microtesla (μT) or milligauss (mG). No need to remember the conversion factors.

Relative Display Mode

The relative display mode permits the measurement of changes in the magnetic field vector from an initial value. A simple press of the REL key nulls the currently displayed value and thereafter displays the change from that value until the key is pressed again.

Multiple Analog Outputs

The raw analog magnetometer signals as well as the processed signals are available for recording or further processing through an 8-pin microDIN connector.

Remote Operation

The FVM-400 can be controlled remotely through a standard RS232 serial connection operating at 9600 baud. In remote mode the user can set the measurement parameters, acquire a sample, initiate a data recording or retrieve previously recorded data.

Data Recording

The FVM-400 has three data recording modes: Snapshot, Record and Manual. The Snapshot function records 7.5 seconds of data at a rate of 69.5 samples per second. The Record function stores 30 seconds of data at a rate of 17.4 samples per second. In Manual mode the user determines when to store a sample. The recorded data can be viewed on the display, sent to the analog outputs or retrieved remotely through the RS232 port.

FM300 Front Panel Software

The FVM-400 comes with a software package that can be used to download, display and save FVM-400 data using an RS232 connection to a PC. Also included is a network server that can be used to log data and provide it to a remote user over the Internet.

Technical Specifications

Field Measurements

Component	Range	Resolution	Accuracy[1]
X, Y, Z	±100,000 nT	1 nT	±(0.25% of reading + 5 nT)
R(esultant)	173,205 nT	1 nT	±(0.5% of reading + 5 nT)
D(eclination)[2]	±180 degrees	0.1 degree	1 degree
I(nclination)[3]	±90 degrees	0.1 degree	1 degree

[1] At 25°C ± 5°C. After correcting for zero field values. Maximum zero field value is 20 nT.
[2] The angle between the X axis and the projection of the field vector onto the XY plane.
[3] The angle between the field vector and the XY plane.

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	2.441 x gain mV/mG	2.441 mV/mG
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 absolute or relative (X, Y, Z) or (R, D, I) components based on the selected mode.
[2] Corresponds to the absolute (X, Y, Z) components.

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 per second	17.4 samples per 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 angle coordinate system.

General Specifications

Temperature Range: 0 to 50°C.

Power: Two nine volt batteries. Lithium is the preferred battery type but Alkaline can also be used. Nominal operating power consumption is 550 mW. Nominal power consumption when powered down is 20 mW.

Operating Time: Twenty four hours continuous operation with Lithium batteries. Four hours continuous operation with Alkaline batteries. The FVM-400 will power down after ten minutes of no keypad activity. In this state the analog circuits are turned off to reduce battery drain. Pressing any key will bring the FVM-400 back to life. The FVM-400 can remain in the power down state for up to 150 hours before the Lithium batteries become exhausted.

Probe Size: 25.4 mm W x 25.4 mm H x 100.6 mm L (1”W x 1”H x 4”L).

Electronics Case: 100 mm W x 44 mm H x 193mm L (3.94”W x 1.73”H x 7.60”L).

Probe To Electronics Cable Length: Seven feet standard. Other lengths are possible up to a maximum length of one hundred feet.

Display: Four lines by sixteen characters LCD. Viewing area dimensions are 60 mm L x 24 mm H (2.36”L x 0.95”H).

Operator Functions

The following operator functions are available through the front panel membrane keypad.

Key	Description
REMOTE	Switches between keypad control and remote RS232 serial port control.
REMOTE[1]	Sends text data continuously out the RS232 serial port at a rate of 4 samples per second. The status line displays Text on the right side. The output data format is shown below. Pressing REMOTE again stops the outputting of data and returns the instrument to local mode. @-009563+049074+020558
COORD	Switches between rectangular (X, Y, Z) and polar (R, D, I) coordinate systems.
UNITS[1]	Selects nT, μT or mG as the displayed units.
SNAPSHOT	Initiates a 7.5 second data recording.
RECORD[1]	Initiates a 30 second data recording.
MANUAL[1]	Enables/disables manual data recording mode.
SAMPLE	Stores a single data point. Must be in Manual recording mode.
CALIBRATE	Outputs 0, +FS, -FS or stepped triangle to the display and the DAC outputs. This can be used to calibrate the DAC outputs or an external recording device.
GAIN	Selects one of eight DAC output gain settings for the displayed component.
REL	Switches between absolute and relative measurement mode. In relative mode the display shows the change in field from the initial value present when the key was pressed.
SCREEN	Displays the stored data on the LCD. Use the arrow keys to move from one sample to another.
PWR DN	Enables/disables power down after 10 minutes of no key activity.
SUSPEND	Powers down the FVM-400 to conserve battery capacity. Hitting any key while the FVM-400 is powered down will return it to normal operation.
↑	Selects the component that will be affected by pressing the REL or GAIN key. Also used to display the next stored sample.
↓	Selects the component that will be affected by pressing the REL or GAIN key. Also used to display the previous stored sample.
DAC	Replays the stored data through the DAC outputs.
RS232[1]	Sends the stored data out the RS232 port.

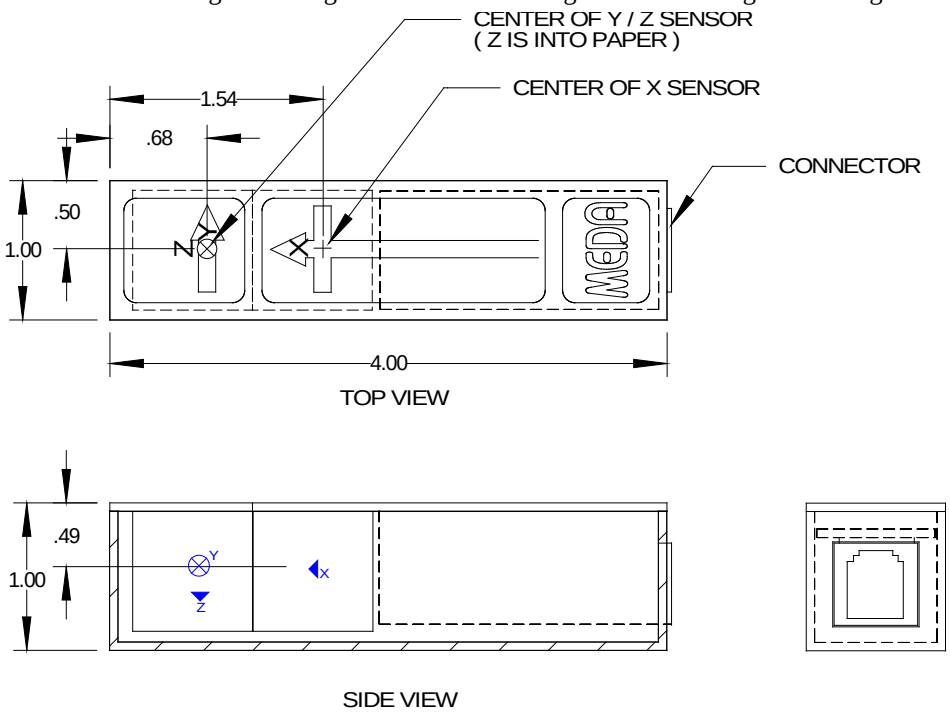
[1] The ALT key must be pressed first to activate this function.

MedicalQC.com
深圳为尔康科技有限公司 联系人：曾祥满 手机：13632925349
QQ：274798107 电话：0755- 28896837 地址：深圳市龙岗区沙平北路111号608A
网址：www.medicalQC.com 邮箱：szchina1718@163.com

Sensor Configuration

The figures below show the fluxgate sensor element locations. All dimensions are in inches.

The sensor consists of two ring core fluxgate elements. One ring core has two signal windings oriented at right

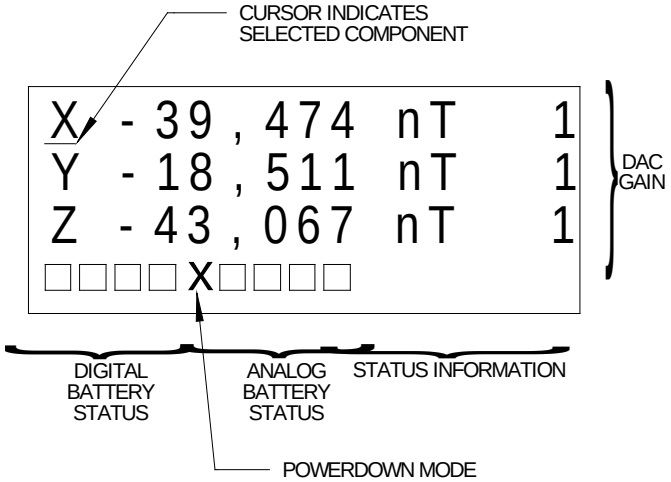


angles to one another. These windings measure the Y and Z magnetic field vector components. The second ring core, which has a single winding and is oriented at right angles to the first ring core, measures the X component of the magnetic field vector. The sensor is connected to the electronics unit by means of a simple standard RJ45 8 conductor modular flat cable.

During calibration, the sensor axes alignment is measured relative to the sensor case bottom surface and front edge. The measured components are then corrected digitally using a matrix transformation. The corrected vector components are the ones displayed on the screen and used to compute the polar coordinates.

Display Layout

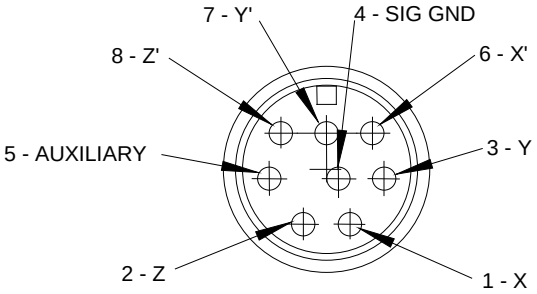
As shown in the figure below, the FVM-400 has a four lines by sixteen characters LCD display. All three vector components are displayed simultaneously along with battery status and power down mode.



Analog Output Connector

The analog output signals are available through an eight pin microDIN connector on the right side of the FVM-400. The figure below shows the connector mechanical configuration and the pin assignments. The analog magnetometer output signals are not calibrated, but their accuracy is better than ±5%. The outputs correspond to the values of the uncorrected rectangular components of the magnetic field vector. Also the output range and scale factor are fixed. The frequency response of the analog magnetometer is greater than 100 Hz, therefore, its analog outputs are useful when making measurements where the signal frequency is beyond the 10 Hz limit of the basic FVM-400 digitally processed signals.

The DAC output signals are derived from the calibrated signals digitally processed by the FVM-400. The DAC output scale factors, ranges, resolutions and vector component associations are determined by the selected coordinate system, individual component gains and the individual component measurement modes (ABS or REL).



NOTE: X, Y, AND Z ARE RAW ANALOG OUTPUTS WHILE X', Y', AND Z' ARE PROCESSED ANALOG OUTPUTS

ANALOG OUTPUT CONNECTOR
(VIEWED FROM SIDE OF CASE)

NOTE: When Polar Coordinates are selected for display, the X', Y' and Z' DAC outputs correspond to the R, D, I value.

ANALOG OUTPUT COORDINATES

PIN	RECTANGULAR	POLAR
6	X'	R
7	Y'	D
8	Z'	I

HKMedQC
Wellcome Technology Co., Limited
Email:ivylin@hkmedqc.com
web:http://www.hkmedqc.com
19H Maxgrand plaza,No.3 Tai Yau Street, San Po Kong,Kowloon,hk