

HMI-1 EMF Survey Meter



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HMI SYSTEMS

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User Manual

General description

The HMI-1 is a small, 120mm x 60mm x 25mm, self-contained instrument for measuring power frequency magnetic fields. The HMI-1 has a number of sophisticated features: it performs a frequency analysis on the field measurements and also collects statistical information on the field values measured while the HMI-1 is switched on.

The instrument measures the magnetic field in three axes and automatically calculates the resultant field. The instrument is auto-ranging and can measure resultant fields up to 6000mG. True RMS quantities are used for all readings. In addition to broadband measurements, the HMI-1 calculates fundamental power frequency and third harmonic components of the field, as well as the totality of fundamental and power frequency harmonics. The displayed reading updates once per second.

The HMI-1 uses a 16x2 character LCD alphanumeric display. A push button switch on the front of the instrument cycles the display through six screens. This allows a great deal of information to be displayed to the user.

While the instrument is primarily a survey meter and has no external connections, the HMI-1 collects

statistics on the field while the instrument is switched on. The percentage distribution of the broadband resultant RMS field readings in eight "bins", (0-4mG, 4-10, 10-30, 30-100, 100-300, 300-1000, 1000-3000, 3000-6000), is collected and displayed on one screen. Also, minimum and maximum values of the field during the time the meter is switched on are recorded. The instrument uses a standard 9 volt alkaline battery and the average (over one second) current drain is less than 10 mA.

Warning!!!

Do not attempt to open the instrument, since it may result in damage, and will void the warranty.

Operation

The unit has two controls:

- A slide switch which turns the unit on and off
- A push button switch which cycles the display through six screens of measurement functions.

There are two important points to note:

- Turning the unit off causes the instrument to lose all stored statistical data.
- Pressing the button to advance the displayed screen does not destroy any data.

Basic Operation

The most basic use of the instrument requires only that it be switched on. After this is done, the logo appears on the display for two seconds, followed by the battery voltage for three seconds. After that, the meter displays the RMS value of the resultant broadband magnetic field in units of milliGauss (mG), along with the components in each axial direction. These field values are all updated once per second.

The instrument is capable of displaying six different screens. Briefly pressing the button advances to the next screen. Holding the button down causes the screens to advance automatically, at a rate of one screen per second. Releasing the button then leaves the instrument displaying the selected screen. The screen contents are described below. The screens update cyclically, that is, after Screen 6, Screen 1 appears again, and so on.

Screen 1: RMS broadband field values. Four quantities are displayed:

- **bbr** Resultant (vector sum of x, y, z field components)
- **x** x-field component (directed across face of instrument)
- **y** y-field component (up and down face of instrument)
- **z** z-field component (into face of instrument)

This is the most basic measuring screen for the instrument.

Screen 2: Resultant frequency components. Here, four resultant quantities are displayed

- **Rbb** Broadband
- **Σ h** Totality of power harmonics
- **1h** Fundamental component (50 Hz)
- **3h** Third harmonic component (150 Hz)

Screen 3: X-axis frequency components. This screen displays the x-axis components of the quantities in Screen 2.

- **xbb** Broadband x-component
- **Σ h** Totality of power harmonics in x-direction
- **1h** Fundamental component in x-direction
- **3h** Third harmonic component in x-direction

Screen 4: Min, max, average and standard deviation of resultant broadband RMS readings since switch-on.

- **bb [0.5, 0.9]** min, max
- **av 0.7 sd 0.1** average, standard deviation

If the maximum value of the field exceeds 6000mG, this is shown as ">6000". When this occurs, the displayed average and standard deviation values are approximate, calculated as if the large field readings were at 6000mG.

Screen 5: “Histogram” of resultant broadband RMS readings since switch-on. The values displayed alongside each label (A-H) indicate the percentages of field readings that have occurred in the field level ranges shown in the table below.

Label	A	B	C	D
mG range	0 - 4	4 - 10	10 - 30	30 - 100

Label	E	F	G	H
mG range	100 - 300	300 - 1000	1000 - 3000	3000 – 6000

The percentages displayed are rounded to the closest whole number of percent. The only exception to this is that percentages above 99.5 are represented as 99. An asterisk * is used to indicate when a small number of readings, (that is, at least one reading and less than 0.5% of all readings) falls in one of the tabulated ranges.

For example, suppose the screen reads:

**%A56 B29 C 5 D 9
E * F 1 G* H 0**

This means that, since switch-on:

- A** (56.0±0.5)% of the broadband resultant RMS readings were between 0 and 4 mG;
- B** (29.0±0.5)% were between 4 and 10 mG;
- C** (5.0±0.5)% were between 10 and 30 mG;
- D** (9.0±0.5)% were between 30 and 100 mG;

- E** At least one reading, but less than 0.5% of all readings had values between 100 and 300 mG;
- F** $(1.0 \pm 0.5)\%$ of readings were between 300 and 1000 mG;
- G** At least one reading, but less than 0.5%, occurred between 1000 and 3000 mG;
- H** There were no readings above 3000 mG.

Screen 6: Battery voltage and ON time (hh:mm:ss). “ON time” is the time for which the instrument has been switched on and has been taking measurements.

Other Features

Screen “blinking”

After one hour of continuous use, if the button is not pressed, the screen displays the message “Press button for display”. Pressing the button will cause the screen to display measured data again. Note that statistical recording continues irrespective of the button use.

Data Retention Mode (DRM)

Screens 4 and 5 involve recording statistics of measured data. In order to reduce the risk of losing this data when the battery voltage becomes too low, a data retention mode (DRM) is provided, under which very little battery current is drawn.

When the battery voltage falls below 6.5 volts, as indicated on screen 6, the HMI-1 enters the data retention mode. Once in this mode, no further

measurements can be taken, but data collected in screens 4, 5 along with the elapsed time before the mode was entered, are retained and can be displayed by pressing the button cyclically through three screens. This mode is distinguished by the flashing of the top left displayed character on the LCD.

DRM Screen 1: Displays ON time frozen when HMI-1 entered DRM

DRM Screen 2: same as screen 4

DRM Screen 3: same as screen 5

If, at switch-on, the battery voltage is less than 6.5 volts, but high enough to operate the display, the instrument will display:

**Replace battery.
No data saved.**

with the top left character flashing.

Specifications

Measurements: True RMS magnetic flux density in three axes and resultant.

Accuracy: $\pm 2\% \pm 1$ digit typical for a 50 Hz sinusoidal field.

Frequency response: 30 Hz – 1000 Hz (+1dB, -3dB relative to 50 Hz response)

Measuring ranges. The HMI-1 auto-ranges between three measurement ranges

- 0-99.9 mG 0.1mG resolution
- 100-999 mG 1 mG resolution
- 1000-6000 mG 1mG resolution

Magnetic field frequency components displayed

- Broadband
- Totality of fundamental and power harmonics
- Fundamental (50 Hz) frequency component
- Third harmonic (150 Hz) frequency component

Collected statistics since switch-on:

- Min, Max of broadband RMS values
- Mean and Standard Deviation of broadband RMS field values

- Records percentage of broadband RMS field values in eight ranges:

0 – 4 mG	4 – 10 mG	10 – 30 mG	30 – 100 mG
100 – 300 mG	300 – 1000 mG	1000 – 3000 mG	3000 – 6000 mG

- Elapsed time since switch-on

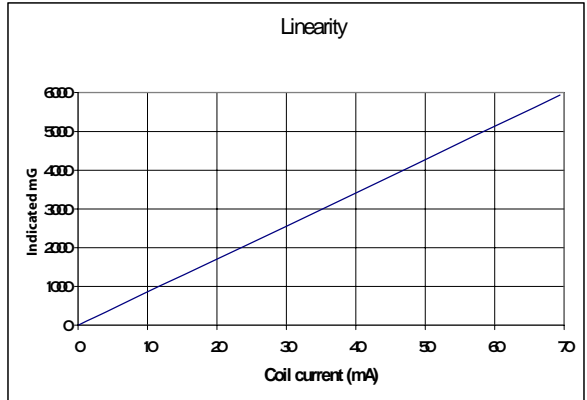
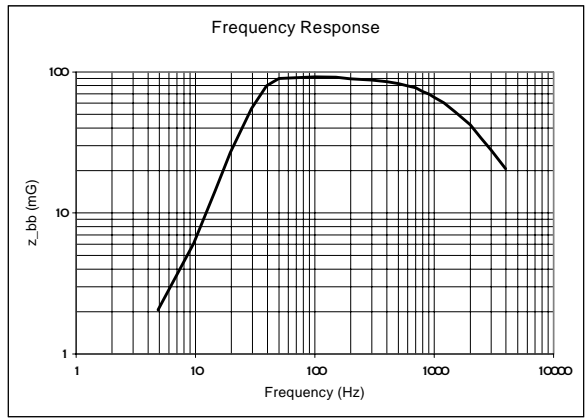
Provision for retention of statistical data under low battery (< 6.5V) condition.

Battery life: Greater than 48 hours continuous use from a standard 9 volt alkaline battery. Battery current consumption is less than 10 mA (averaged over one second).

Operating Environment: -5°C +50°C, up to 90% RH

Size: 120mm x 60mm x 25mm

Weight: 95 grams (without battery)



Warranty conditions

HMI Systems warrants that this unit is free from defects in materials and workmanship affecting normal use for a period of one year from the date of purchase. The warranty is limited to the original purchaser and is not transferable.

This warranty is limited to making good or replacing any part which appears upon inspection by the manufacturer or his agent to be defective in material or workmanship.

This warranty does not oblige the manufacturer or his agents or dealers to bear the transport costs incurred in the repair or replacement of any defective part.

This warranty does not cover damage, fault, failure or malfunction due to external causes, including accident, abuse, misuse, or any attempt by an unauthorized person to adjust or repair the unit.

HMI Systems does not give any warranty that the unit is fit for any particular purpose and this warranty is given in place of all warranties, conditions, terms, undertakings and obligations implied by statute, common law, trade usage, course of dealing or otherwise including warranties or conditions of merchantability, fitness for purpose, satisfactory quality and/or compliance with description, all of which are hereby excluded to the fullest extent permitted by law.

HMI Systems will not be liable for any incidental, indirect, special or consequential damages arising out of or in connection with the purchase, use or performance the unit, even if HMI Systems has been advised of their possibility.

The warranty is made void by the removal of the back cover of the unit by persons other than the manufacturer or his authorized agent.