HEWLETT PACKARD

Application Note 369-3

Impedance Measurements of Magnetic Heads Using Constant Current

In Production and Quality Control Departments

– HP 4284A Precision LCR Meter –

Introduction

Measuring the impedance of a magnetic head is a valuable technique for checking its quality. This type of measurement involves the following difficulties and demands.

- It must be possible to conduct constant-current measurements at a number of frequency points, not only in the development department, but also in the production and quality control departments as well. It should also be easy to change from one set of measurement conditions to another when testing different devices.
- The additional errors caused by test fixtures, measurement cables, and the like prevent reliable measurements. These types of errors must be minimized.
- Discrepancies between measurement values of different channels when a scanner is used must be able to be compensated for.

Conventional instruments cannot meet these demands.

Solutions Offered by the HP 4284A

1. Easy Constant Current Measurements

The ALC[1] function allows easy constant current measurements within a range of 100 µA to 100 mA[2] even when measurement conditions such as the measurement frequency are modified. Since the current of the measured signal need not be monitored to perform adjustments as is the case with conventional instruments, constant-current measurements are quick and efficient.

2. GO/NO-GO Testing of Several Frequency Points

The List Sweep function[3] allows sweeping of any of 10 frequencies. Since it is possible to limit the measurement value per frequency, GO/NO-GO testing of constant current measurements can easily be performed at several frequencies.

3. A Memory Card Allows for Easy Setups

A maximum of ten instrument settings for measurement conditions can be recorded on a single memory card. By preparing measurement conditions for different samples it is easy to go from one type of measurement to another without making mistakes.

4. A Powerful Error Compensation Function Reduces the Additional Errors Caused by Test Fixtures, and Measurement Cables

This function minimizes the influence of test fixtures on the test results.

5. Multi-Channel Compensation Minimizes Discrepancies Between Scanner Channels

The use of a scanner interface[4] compensates for channel discrepancies for up to a maximum of 128 channels. This function prevents discrepancies in measurement values between different channels, and ensures stable measurements.

Measurement Example

As seen in Figure 1 the setup menus on the large LCD screen of the HP 4284A facilitates set up operations. The frequency of the List Sweep function and limit value settings can also be performed with the use of menus. Figure 2 shows an example of a constant-current L - D measurement, and Figure 3 shows a List Sweep and a GO/NO-GO test result using limit values.

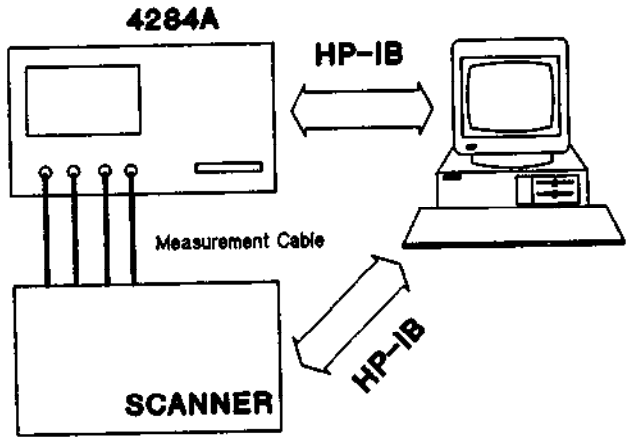
```
<MEAS SETUP>                SYS MENU

FUNC :  Lp-Q        RANGE:   AUTO
FREQ :100.000kHz    BIAS :  0.000 V
LEVEL:*  1.00mA     INTEG:    MED

TRIG :     INT      AVG  :      1
ALC  :      ON      Vm   :     ON
Hi-PW:     OFF      Im   :     ON
DELAY:       0ms

DEV A: OFF      REF A: 0.00000 H
    B: OFF          B: 0.00000
```

The Constant-Current mode is turned ON by setting ALC to ON.

Figure 1. Setup Menu

Using a Scanner Interface

A conceptual drawing of the connection of a scanner using the scanner interface is shown below.




```
        <MEAS DISPLAY>              SYS MENU

FUNC :  Lp-D        RANGE:   AUTO
FREQ :1.00000kHz    BIAS :  0.000 V
LEVEL:*  1.00mA     INTEG:    MED


    Lp :   2 3 1 . 9 7 0 m H


    D  :   . 3 8 6 2 5 6


Vm  :  1.365 V     Im  :  1.004mA
CORR: OPEN,SHORT
```

The current monitor shows that this is a constant current measurement.

Figure 2. Constant Current L - D Measurement Example

```
<LIST SWEEP DISPLAY>     SYS MENU

MODE : SEQ
 FREQ[Hz]   Lp[ H ]     D[    ]  CMP
 1.00000k   231.637m   .385448
 50.0000k   199.836m   .231003    L
 80.0000k   298.000m   .464964
 100.000k   521.034m   .988626    H
```

Figure 3 GO/NO-GO Test Measurement Example Using List Sweep

Conclusion

The HP 4284A Precision LCR Meter enables easy constant current measurements not possible with conventional LCR meters. The powerful error compensation function (OPEN/SHORT/LOAD compensation, multi-channel compensation), point sweep of desired frequency (List Sweep), and other functions greatly contribute to increasing the efficiency and reliability of impedance measurements of magnetic heads during manufacture, and in quality control departments.

[1] Automatic Level Control

[2] When Option 001 is used

[3] The List Sweep function enables performing constant-current measurements by means of sweeping the desired frequencies simultaneously with GO/NO-GO tests of limited values.

[4] Option 301

For more information, call your local HP sales office listed in the telephone directory white pages. Ask for the Electronic Instrument Department, or write to Hewlett-Packard: **U.S.A.** - P.O. Box 10301, Palo Alto, CA 94303-0890 **Europe** - Hewlett-Packard S.A., P.O. Box 529, 1180 AM Amstelveen, The Netherlands. **Canada** - 6877 Goreway Drive, Mississauga, L4V 1M8, Ontario. **Japan** - Yokogawa-Hewlett-Packard Ltd., 3-29-21, Takaido-Higashi, Suginami-ku, Tokyo 168. **Far East** - Hewlett-Packard Asia Headquarters, 47/F China Resources Building, 26 Harbour Road, Wanchai Hong Kong. **Australasia** - Hewlett-Packard Australia Ltd., 31-41 Joseph Street, Blackburn, Victoria 3130 Australia. **Latin America** - Hewlett-Packard Latin America Headquarters, 3495 Deer Creek Rd., Palo Alto, CA 94304. For all other areas, please write to: Hewlett-Packard Intercontinental Headquarters, 3495 Deer Creek Rd., Palo Alto, CA 94304.

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