Digital Manual/Autoranging Impedance Meter

IMF-600A Series

Various output options and autoranging make the ***IMF-600*** *an attractive choice for many impedance measurement and process requirements.*

CAPACITANCE • INDUCTANCE • RESISTANCE

- C-L-G-R
- Dissipation for capacitors
- 1/Q for inductors
- Analog, digital, or 4-20 mA outputs
- High accuracy
- Protected circuitry
- Very broad range
- Analog & digital outputs
- 4-wire shielded Kelvin test terminals
- Excellent for locating shorts
- Companion comparator unit
- Optional autoranging
- Optional battery pack

Model ***IMF 600-A*** Impedance Meter

DESCRIPTION

A perfect bench companion to your DMM, the **IMF-600A** is a cost effective manual or autoranging digital impedance meter that complements the basic DMM to complete your test and measurement needs. With its low resistance measurement capacity and Kelvin leads, the **IMF-600A** is invaluable for locating PC board shorts.

A number of attractive features make it a versatile device. A companion limits comparator, Model **LC-603**, allows selection for all functions, on a GO/NO GO basis for inspection, sorting, quality control, component selection, etc...

Automatic measurement for all functions is provided automatically with a 3½ digit display. No balancing or manual operations are required.

Analog & digital outputs may be used to interface to comparators or other devices.

4-Wire shielded Kelvin test terminals - short circuit location ensures precision measurements even for very low impedances like contact or wire resistance and makes locating PC board short circuits an easy task.

Principle of Operation

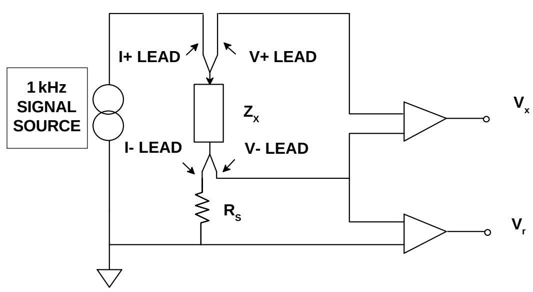
The impedance Z_x of an unknown component **X** is defined as:

$$Z_x = V_x / I_x$$

where V_x is the voltage across the unknown and I_x is the current through the unknown. The **IMF-600A** implements this computation as shown conceptually in the figure. A sine wave generator drives current I_x through unknown Z_x and the standard resistor R_s in series with it. Two ac coupled differential amplifiers measure the voltages V_x and V_r across the unknown and the resistor respectively. The impedance Z_x is then computed as follows:

$$Z_x = V_x / I_x$$

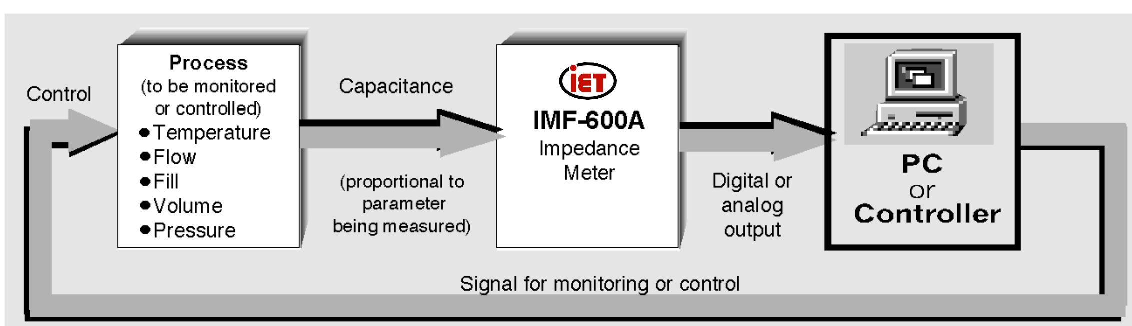
$$Z_x = R_s V_x / V_s$$



Except for pure resistance and conductance, Z_x is a complex ratio with real and imaginary components which are then computed. The voltage being measured, e.g. Vx is broken down into the "in phase or 0°" and the "quadrature or 90°" components with respect to the test signal. These are used to provide the real and imaginary portions of the complex impedance. A pure resistance, for example, will produce only an "in phase" component, whereas an ideal capacitor will result in only a "quadrature" signal.

PROCESS CONTROL APPLICATIONS

Many industrial and manufacturing processes such as flow or fill procedures or many similar fabricating steps lend themselves to automatic control since the parameter to be controlled is often proportional to the capacitance.



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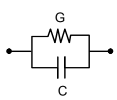
IMF-600A Series

GENERAL SPECIFICATIONS

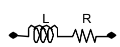
C - Range	1*	2	3	4	5	6	7	8
Full Scale	200 pF	2 nF	20 nF	200 nF	2 µF	20 µF	200 µF	2000 µF[1]
Resolution	0.1 pF	1 pF	10 pF	100 pF	1 nF	0.01 µF	0.1 µF	1 µF
Test Signal	1.0 Vrms		100 mVrms					10 mVrms
Accuracy[4]	±(0.25% + 1 LSD +0.5% G reading)	±(0.25% + 1 LSD + 0.5% G reading)					±(0.25% + 1 LSD +0.2% G reading)	±(5% + 1 LSD +1% G reading)
G - Range	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Full Scale	2 µS	20 µS	200 µS	2 mS	20 mS	200 mS	2000 mS	20 S
Resolution	0.001 µS	0.01 µS	0.1 µS	1 µS	10 µS	0.1 mS	1 mS	10 mS
Test Signal	1.0 Vrms		100 mVrms					10 mVrms
Accuracy	±(0.25% + 1 LSD +0.5% C reading)	±(0.25% + 1 LSD + 0.5% C reading)					±(0.25% + 1 LSD +0.2% C reading)	±(5% + 1 LSD +1% C reading)
L - Range	**1****	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Full scale	200 µH	2 mH	20 mH	200 mH	2 H	20 H	200 H	200 H
Resolution	0.1 µH	1 µH	10 µH	0.1 mH	1 mH	10 mH	0.1 H	0.1 H
Test Signal	100 mA	10 mA	1 mA	100 µA	10 µA		1 µA	
Accuracy[4]	±(0.25% + 1 LSD +0.5% R reading)	±(0.25% + 1 LSD + 0.5% R reading)					±(0.25% +1 LSD +0.5% R reading)	
R - Range	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Full Scale	2 Ω	20 Ω	200 Ω	2 kΩ	20 kΩ	200 kΩ	2 MΩ	2 MΩ[2]
Resolution	1 mΩ	10 mΩ	0.1 Ω	1 Ω	10 Ω	100 Ω	1 kΩ	1 kΩ
Test Signal	100 mA	10 mA	1 mA	100 µA	10 µA		1 µA	
Accuracy	±(0.25% + 1 LSD +0.5% L reading)	±(0.25% + 1 LSD + 0.5% L reading)					±(0.25% + 1 LSD +0.5% L reading)	
D - Range	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Full Scale	1.999[3]							
Resolution	0.001							
Accuracy[4]	±(1% + 0.002) for L or C > 200 counts ±(2% + 0.01) for L or C 50 to 199 counts							±(5% + 0.01)

Impedance Models:

Parallel for C and G:



Series for L and R:



Test Conditions:

1. After correction for test lead zero reading.
2. After 10 minute warm up.
3. Between 15°C and 35°C.

Test Frequency: 1 kHz ±1%.

Measurement Rate: 2.5 measurements per second.

Analog Outputs: Impedance quantity and dissipation **D** are simultaneously available at the rear panel, scaled at 1 V/1000 counts; accuracy: ±(0.25% of display + 1 mV).

Digital Output (Optional): 3-1/2 digit, BCD, for data and 3 bits for range; TTL, positive true.

Current Output (Optional): 4-20 mA corresponding to 0-2000 counts of display.

Input Protection: Diode and resistor discharge network.

External dc Bias: Up to 100 V, floating, may be applied across a capacitive component through screw terminals on the rear panel terminal strip; 0.1 A maximum.

Power Requirements: 105-125 V or 210-250 V, 50-60 Hz; 5 W.

Calibration Interval: 12 months.

Dimensions: 21.6 cm W x 11.4 cm H x 30.5 cm D (8.5" x 4.5" x 12.0")

Weight: 6.8 kg (15 lb).

NOTES

*** HSC Option** High sensitivity capacitance range option. 20 pF full scale; 0.01 pF resolution; 1.0 Vrms test signal; accuracy[4] (±0.25% + 0.3 pF).

**** HSL Option** High sensitivity inductance range option. 20 µH full scale; 0.01 µH resolution; 100 mA test signal; accuracy[4] ±(0.25% + 0.5 µH).

1. Capacitance: Higher capacitance (>200 µF) may be measured on the inductance function by the following conversion: Series model capacitance C=-2.533 x 10^{-8} /L.

2. Resistance: Higher resistance (>2 MΩ) may be measured on the conductance function Range 1: R (in ohms) = 1/G (in siemens).

3. Dissipation (D or 1/Q): Obtain D values by pressing D button. Values greater than 1.999 may be computed as follows:

D= G/2πfc = 1.592 G'/C'

Q=2πfL/R = 0.628 L'/R'

where G', C', L', and R' are in counts on the same range.

4. Accuracy: After correction for test lead zero reading; 15°C - 35°C; C, L, G, or R readings are in absolute counts; ignore decimal point.

ORDERING INFORMATION

IMF-600A	Digital Impedance Meter
IMF-600AR	Autoranging Digital Impedance Meter
-HSC Option	High Sensitivity Capacitance (20 pF Range)
-HSL Option	High sensitivity inductance (20 µH Range)
-DO Option	Digital output of reading and range
-I Option	Current output (4-20 mA corresponding to 0-2000 counts of display)
LC-603	Single Channel Digital Limits Comparator (Requires DO option; may be cascaded)
BP-511	Battery Pack, AC Source, 115 V, 60 Hz, 300 W (see p. 45)

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