

impedance  
**Analyzer 16777k**

technical specifications

**General Specifications**

power consumption	5 VDC; 400mA
power source	USB port
control interface	USB port
built-in protection	USB interface galvanically isolated (1000 VDC /1min, 3000 VDC /1sec)
weight	0.2 kg
dimensions	32 x 81 x 126 mm (without connectors)
operating condition	-15 to +65 °C / 0 to 150 °F at < 80% humidity, non condensing (extended range on request)
electromagnetic compliance	emitted radiation: EN 55011, class B (stringest class) immunity against discharge: EN 61000-4-2, criterion A (highest immunity) immunity against EM fields: EN 61000-4-3, criterion A (highest immunity)

**Probe Port Specifications**

terminal type	BNC
output signal amplitude	measurement on: max. 316 mV <sub>p</sub> max. 9,6 mA <sub>p</sub> measurement off: no signal
output impedance	measurement on: 33 Ohm measurement off: 330 kOhm
discharge energy absorption	max. 1 millijoule
probe calibration function	to compensate individual probes against series and parallel R, parallel C, series R, series L

**Frequency Characteristics**

frequency range	1kHz to 16.777 MHz
frequency sweep stepwidth	1 Hz to 250 kHz;
frequency resolution	1 Hz
absolute frequency error	typ. +/- 0,001%

**Display Modes**

impedance values	versus frequency:  Z  (Impedance Magnitude), $\varphi$ (Phase), R (Resistance), X (Reactance) dual plots:  Z  and $\varphi$ vs.Frequency, R and X vs.Frequency complex plot: X versus R (Nyquist Diagram)
admittance values	versus frequency:  Y  (Admittance Magnitude), $\varphi$ (Phase), G (Conductance), B (Susceptance) dual plots:  Y  and $\varphi$ vs.Frequency, G and B vs.Frequency complex plot: B versus G (Nyquist Diagram)
capacitance	Capacitance vs. Frequency
inductance	Inductance vs. Frequency
scaling options	full-scale automatically or manually settable; linear or logarithmic display option for both axis

**Data Storage & Handling**

save/load options	- save/load measurement as data - save/load parameter and probe calibration only - save measurement as picture only (bmp, jpg, or png)
printing options	- graph only - full panel
data export options	- text file format (*.txt) - Microsoft Excel file format (*.xls) - MathWorks MatLab file format (*.mat)

**System Requirements**

minimum PC/Laptop <sup>†</sup> requirements	- 1 GHz clock rate - 256 MByte RAM - 300 MByte available harddrive space - 1024 x 600 pixels resolution - CD-ROM drive (for installation of user software)
operating system <sup>†</sup>	Microsoft Windows 2000, 2003, ME, XP, Vista, or Windows 7 (other on request)

<sup>†</sup> not included

**Measurement Range**

impedance values	10 mΩ to 100 kΩ
admittance values	10 μS to 100 S
capacitance	0.1 pF to 10 mF
inductance	0.1 nH to 10 H
phase	+90 to -90 degree; $+\pi/2$ to $-\pi/2$

**Measurement Time**

standard operation	approx. 30 msec per frequency step
with noise reduction	approx. 60 msec per frequency step
additional optional delay time	settable from 3 msec to 300 msec / frequency step (for high-Q measurements)

**Measurement Accuracy** (at 21-24°C / 70-75°F; warm up time 15 min)

impedance values	typical full frequency range error (50 Ohm):	0.05 %
	typical full frequency range error (shortened probe):	+/- 10 mΩ
	typical single frequency repetitive error (shortened probe):	+/- 1 mΩ
typical 100 kHz BW error (%), full Z range:		$(3\text{m}\Omega/Z + Z/300\text{k}\Omega) \cdot 100\%$ (see Fig.1)
admittance values	typical full frequency range error (20 mS):	0.05 %
	typical full frequency range error (open probe):	+/- 10 μS
	typical single frequency repetitive error (open probe):	+/- 1 μS
typical 100 kHz BW error (%), full Y range:		$(3\mu\text{S}/Y + Y/300\text{S}) \cdot 100\%$ (see Fig.1)
phase	see Figure 2	
capacitance	see Figure 3	
inductance	see Figure 4	

Figure 1: Magnitude Error versus Load

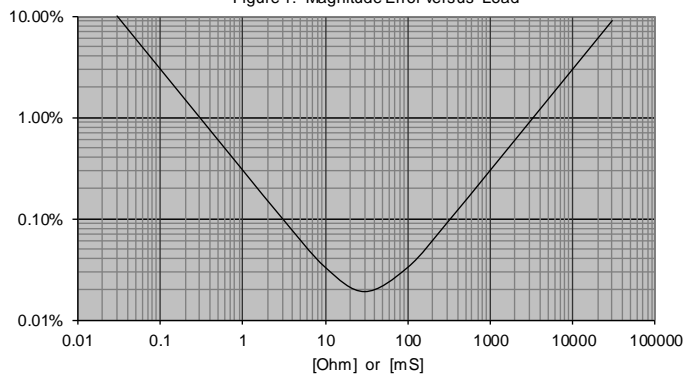


Figure 2: Phase Error versus Load

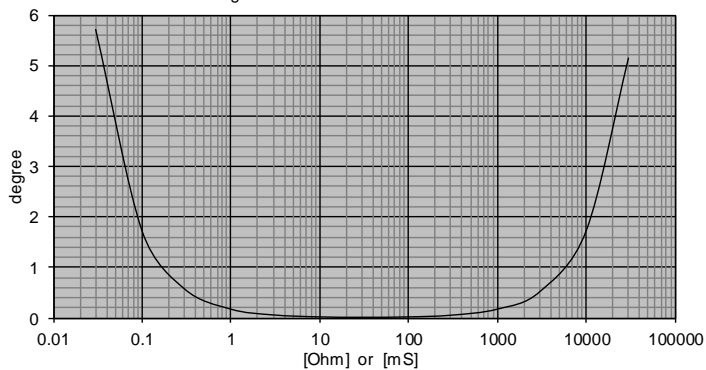


Figure 3: Capacity error versus Frequency

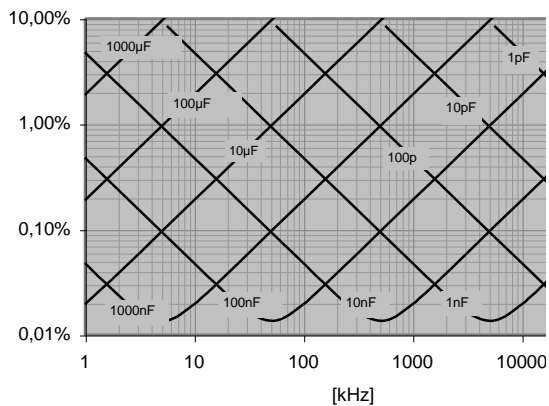


Figure 4: Inductivity Error versus Frequency

