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**FLUKE®**

**i50s**  
Current Probe

**PSi50s**  
Power Supply

**Users Manual**

PN 2842332

June 2007

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# ***i50s Current Probe/ PSi50s Power Supply***

## ***Introduction***

### **⚠ ⚠ Warning**

**To avoid electrical shock or possible injury, do not use the i50s Current Probe with oscilloscopes with floating inputs, i.e. oscilloscopes not referenced to ground.**

The i50s Current Probe (“the Probe”) has been designed for use with oscilloscopes for accurate, non-intrusive measurement of ac, dc and complex waveform currents. Using advanced Hall Effect technology the Probe can accurately measure currents over the frequency range of dc to 50 MHz with a measuring range up to 50 A peak. The Probe is a general purpose, universal current Probe which can be used with any oscilloscope.

### **⚠ ⚠ Warning**

**To avoid electrical shock or possible injury, use the PSi50s Power Supply only with i50s Current Probes.**

The PSi50s Power Supply (the “Power Supply”) is an external power supply that can simultaneously power two i50s Current Probes. The Power Supply is supplied from single-phase mains 115 or 230 V ac, with frequencies from 44 to 60 Hz, and provides a symmetrical dc voltage of  $\pm 12$  V.

## Safety Instructions

Please read this section carefully. It will make you familiar with the most important safety instructions for handling your product. In this manual, a **Warning** identifies conditions and actions that pose hazard(s) to the user. A **Caution** identifies conditions and actions that may damage the Probe, Power Supply, or the test instruments.










### Warning

**The Probe and Power Supply may only be used and handled by qualified personnel. To avoid electrical shock or personal injury, follow these precautions:**

- **Use caution during installation and use of these products; high voltages and currents may be present in circuits under test.**
- **Do not use the Probe or Power Supply if damaged. Always connect the Probe to display device before it is installed around the conductor.**
- **If the Probe or Power Supply is not used in a manner specified by the manual, the protection provided may be impaired.**
- **Use the Power Supply only with i50s Current Probes.**
- **Do not use the Probe without consulting local and national safety codes and use of protection equipment is recommended.**
- **Do not hold the Probe beyond the tactile barrier (see Figure 1).**
- **Before each use, inspect the Probe and Power Supply. Look for cracks or missing portions of the housing or output cable insulation. Also look for loose or weakened components. Pay particular attention to the insulation surrounding the jaws.**
- **Use caution when working with voltages above 60 V dc, 30 V ac rms or 42 V ac peak. Such voltages pose a shock hazard.**
- **Do not use the Probe or Power Supply in wet environments or in locations that hazardous gases exist.**
- **Inspect the Power Supply and power cord and ensure that they are not damaged.**
- **This product has no serviceable parts, do not open the Power Supply.**
- **Check to make sure that the voltage selector switch on the back panel of the Power Supply is set to the correct mains input voltage before connecting power.**

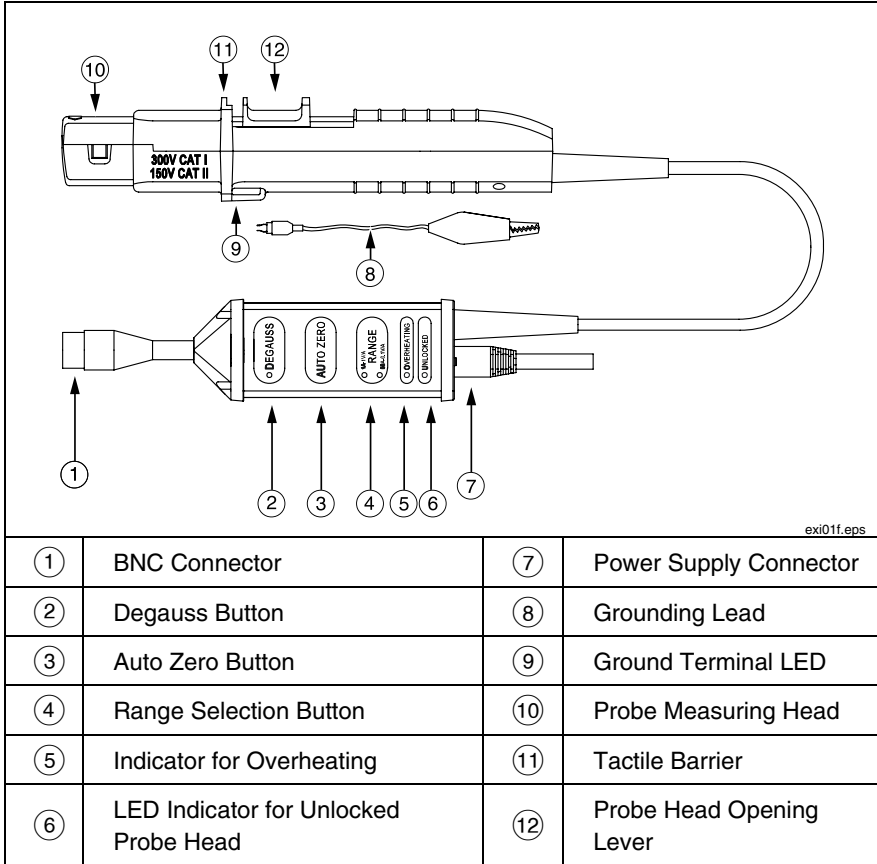
## Symbols

The table below lists the symbols used on the Probe and/or in this manual.

Symbol	Description
	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.
	Important Information. See manual.
	Hazardous Voltage. Risk of electric shock.
	Do not apply to or remove from hazardous, live conductors without taking addition protective measures.
	Double insulation.
	Fuse.
	Conforms to Canadian Standards Association.
	Complies with the relevant European standards.
	Conforms to Australian standards.
CAT I	CAT I equipment is designed to protect against transients from high-voltage, low-energy sources, such as electronic circuits or a copy machine.
CAT II	CAT II equipment is designed to protect against transients from energy-consuming equipment supplied from the fixed installation, such as televisions, personal computers, portable tools, and other household appliances.



## Probe Features



①	BNC Connector	⑦	Power Supply Connector
②	Degauss Button	⑧	Grounding Lead
③	Auto Zero Button	⑨	Ground Terminal LED
④	Range Selection Button	⑩	Probe Measuring Head
⑤	Indicator for Overheating	⑪	Tactile Barrier
⑥	LED Indicator for Unlocked Probe Head	⑫	Probe Head Opening Lever

**Figure 1. i50s Features**

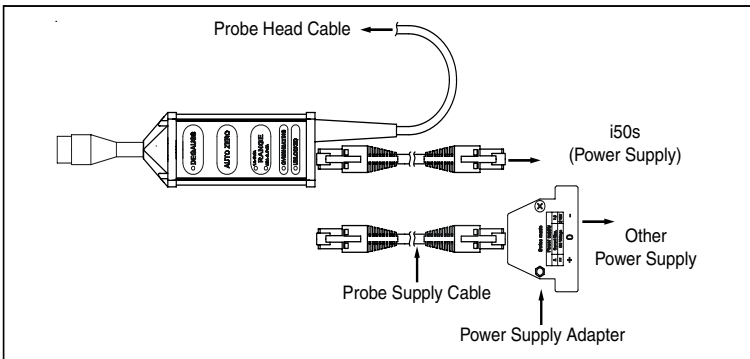
## **Probe Operating Instructions**

The following sections list the Probe operating instructions.

### **Connections**

For these connections, refer to Figures 1 and 2. To connect the Probe, do the following:

1. Connect the BNC connector, to the oscilloscope input. Ensure that the input impedance is  $\geq 1\text{ M}\Omega$ .
2. Connect a  $\pm 12\text{ V}$  external power supply to the power supply connector on the Probe interface. Do not switch on the power supply until the power supply connections are made using the power supply cable with or without the adapter provided.
3. When measuring currents with fast voltage variations (high  $dv/dt$ ) of the primary current, connect the ground terminal on the Probe to ground.



**Figure 2. Connections**

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## **Activating the Probe**

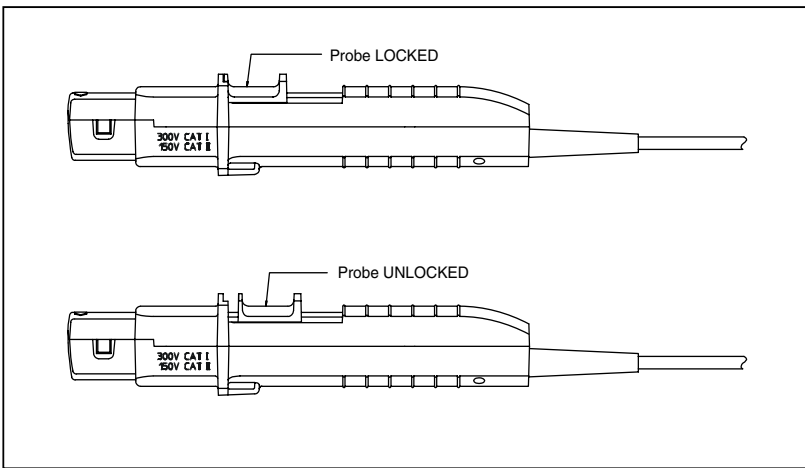
There are two possibilities of supplying power to the Probe:

1. Use the recommended PSi50s Power Supply.
2. Use any suitable power supply and connect the power supply lead using the adapter provided (see Figure 2).

### *Note*

*In order for the Probe to function correctly, the characteristics of the power supply must be in accordance with the requirements in “Specifications”.*

Before activating the Probe, ensure that the Probe head is locked with no primary conductor (see Figure 3).



exi03f.eps

**Figure 3. Locking and Unlocking the Probe**

When turning on the Probe :

- All the LEDs will light up for one second.
- Demagnetization is automatically started; the DEGAUSS LED will light up for approximately six seconds.
- Auto zero is initiated to remove the residual offsets for the two ranges.

- High range (100 mV/A) is selected and the corresponding LED lights up. The Probe is now ready to measure current.

*Note*

*Do not operate the Probe during the activation sequence.*

## **Current Measurement**

To measure current, clamp the Probe around the current carrying conductor and use the slide to ensure that the Probe head is locked (see Figure 3).

A positive output is obtained when the current flows in the direction of the arrow on the Probe head.

### **⚠ Caution**

**The performance of the Probe deteriorates if there is mechanical stress within the aperture, hindering the correct closing of the measuring head.**

*Note*

*If a 50  $\Omega$  load is used, the amplitude of the output signal is halved, and the specifications are no longer guaranteed.*

## **Range Selection**

Two ranges are available by pressing the RANGE button:

1. High range (100 mV/A): oscilloscope 1 M $\Omega$  measurement up to 30 A continuous and 50 A pk (< 10s).
2. Low range (1 V/A): oscilloscope 1 M $\Omega$  measurement up to 3 A max.

## **Auto Zero**

An auto zero of the residual offset is initiated by pressing the AUTO ZERO button. This should only be performed when the Probe head is locked, with no primary conductor.

The auto zero can, however, be made as long as the sum of the primary current and the offset does not exceed:

- 250 mA in the low range
- 500 mA in the high range

If the above values are exceeded, all the LEDs will flash simultaneously for five seconds and the Probe will switch back to the state preceding the autozero request. The autozero function will not be performed.

## **Degauss**

Demagnetizing of the Probe head is performed by pressing the DEGAUSS button. The Probe must remain locked without a primary conductor. During this operation, the DEGAUSS LED lights up for six seconds.

An auto zero of the residual offset is then carried out on both ranges.

### *Note*

*During this sequence, all the other controls are disabled.*

## **Indicators**

Several messages can appear on the Probe, alerting an abnormal state:

- **UNLOCKED**

When the Probe head is not locked, the UNLOCKED LED lights and flashes

- **OVERHEATING**

The OVERHEATING LED flashes when a predetermined temperature is reached; measurement is not possible while in this state. Disconnect the power supply and wait for the Probe to cool down. Check that the measured permanent current and the temperature of the primary conductor do not exceed the maximum permitted values.

- **Simultaneous flashing of all LEDs**

All the LEDs flash simultaneously for five seconds when the auto zero has not been carried out correctly. Two reasons can cause this phenomenon:

1. The Probe is strongly magnetized
2. The primary current is present during the auto zero function

The Probe reverts to the state preceding the request, i.e., an auto zero has not been performed but measurement of the current remains possible.

## **Power Supply Operating Instructions**

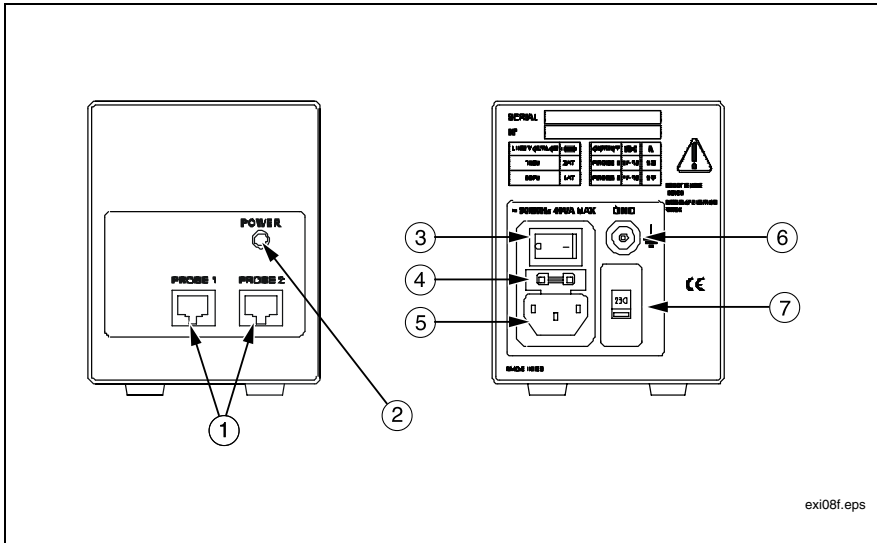
### **⚠ Caution**

**To avoid damaging the Power Supply, use the following guidelines:**

- **Do not disconnect the protective ground.**
- **The mains plug must be connected to a mains voltage supply with a ground terminal.**

To operate the Power Supply (see Figure 4):

1. Select the appropriate mains voltage 230 V or 115 V ac using the voltage selector switch located on the back panel.
2. Fit the rated fuse appropriate to the selected mains voltage.
3. Connect the Power Supply to the mains supply.
4. Connect the Probe(s) to the RJ45 sockets located on the front panel of the Power Supply.
5. Operate the ON/OFF switch on the back panel. The front LED will illuminate to indicate that power is being supplied to the Probe(s).



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Number	Description	Number	Description
①	Probe Power Supply Connector	⑤	Power Supply Connector
②	Power Indicator	⑥	Grounding Terminal
③	Power Switch	⑦	Input Voltage Selector Switch
④	Fuse Holder		

**Figure 4. PSI50s Power Supply**

**Fuse Rating**

The Power Supply is protected by a supplied mains fuse located on the back panel. The fuse ratings depend on the applied voltage, 1 AT for 230 V and 2 AT for 115 V.

## **Maintenance**

### **⚠ Caution**

**To prevent damage to the Probe or Power Supply:**

**Only trained and qualified staff should perform maintenance on the Probe.**

Use only authorized repair parts and all items must be reassembled to their factory-issued configuration.

## **Cleaning**

### **⚠ Caution**

**To prevent damage to the Probe or Power Supply when cleaning:**

- **Do not use strong cleaning detergents or solvents (like trichloroethylene). Clean only using mild soap and water. After cleaning, remove all residue of soap and water.**
- **Do not allow liquid to get inside the instrument.**
- **Do not use sharp tools to clean the end faces of the Probe.**

### **⚠⚠ Warning**

**To avoid electric shock or personal injury, disconnect the power cord prior to cleaning.**

If the Probe requires cleaning, wipe it with a cloth lightly dampened with a mild rinsing agent.



## ***Power Supply Fuse Replacement***

### **⚠ ⚠ Warning**

**To avoid electric shock or personal injury, ensure that the Power Supply is disconnected from the mains supply and that the Probe(s) is disconnected before changing the fuse or opening the fuse compartment.**

Remove the fuse holder cover located on the rear panel and replace the fuse with an appropriately rated one, i.e., 1 AT for 230 V ac and 2 AT for 115 V ac. Re-install the fuse holder cover.

## ***Storage***

When the Probe is not going to be used, store it in the carrying case provided.

## **Specifications**

### **Probe**

The following lists the Probe specifications.

### **Electrical Specifications**

Nominal current	In $\pm$ 30 A dc or A rms
Measuring range	I max $\pm$ 50 A pk (duration <10 sec)
Output voltage Vo	
Low range 1 V/A	1 M $\Omega$
High range 100 mV/A	1 M $\Omega$
Overall accuracy (dc to 100 Hz at 25 °C)	
$\pm$ 0.5 % at IN typical	
$\pm$ 1.5 % at IN max	
Gain variation (max)	$\pm$ 0.04 % of rdg/ °C
Step response	see Figure 5
Frequency response	see Figure 6
Insertion impedance ZI	see Figure 7
< 0.1 $\Omega$ up to 10 MHz	
< 0.4 $\Omega$ 10 MHz to 50 MHz	
External magnetic field rejection rate	60 dB (ac and dc)
Rejection rate of fast dV/dt at 5 kV/ $\mu$ s	< 15 m AT (during dV/dt)
Output noise level (rms) (measured with a filter at 25 MHz)	1 m AT rms typical
Output noise level (pk to pk) (measured with a filter at 25 MHz)	9 mAT pp

## ***Dynamic Characteristics***

Bandwidth	DC to 50 MHz (-3 dB)
Frequency derating (see Figure 8)	10 A at 10 MHz
Rise time, (10 % to 90 %)	$t_r < 7\text{ns}$
Delay time	$t_d < 25\text{ ns}$
Overshoot	$< 5\%$ of reading

## ***General Data***

Aperture dimensions	5 x 5 mm (0.2 in x 0.2 in)
Max primary conductor temp.	60 °C (140 °F)
Dielectric withstand	1350 Vrms / 50 Hz / 1 min
Working Voltage	
CAT I	300 Vrms or dc, Pollution Degree 2
CAT II	150 Vrms or dc, Pollution Degree 2
Operating temperature	0 °C to + 40 °C (32 °F to 104 °F)
Storage temperature	-10 °C to + 60 °C (14 °F to 140 °F)
Maximum	2000 m (6600 ft)
Maximum relative humidity	80 %, 31 °C (87 °F)
Environment	indoor use only
Power supply	$\pm 12\text{ V}, \pm 0.5\text{ V}$
Current consumption	
at nominal	30 A , 550 mA
during demagnetization	1.3 A (for 6 sec)
Probe dimensions	
Length	191.1 mm (7.53 in)
Width	28.9 mm (1.14 in)

Height	40.5 mm (1.59 in)
Weight	400 grams (0.88 lbs)
Output cable length	2 m (6.6 ft)

### **Power Supply**

The following lists the specifications of the Power Supply.

### **Electrical**

V ac Input:

Input voltage V ac	Bivoltage 115/230 V ac with manual selector  On 115 V ac : 115 V ac nominal (103 V ac to 127 V ac)  On 230 V ac : 230 V ac nominal (207 V ac to 253 V ac)
Frequency range of ac voltage	44 to 60 Hz
Protection fuse	1 AT / 230 V ac, 2 AT / 115 V ac, (dim: 5 x 20 mm)
Nominal rated Input current	200 mA / 230 V ac  400 mA / 115 V ac
Nominal VA rating	46 VA

V DC Outputs:

Type of adjustment	Linearly
Output voltages	$\pm 12$ V dc
Output voltage tolerances	+/- 0.5 V dc, I output 0 –1.3 A, U input: $\pm 10$ %
Nominal output current	$\pm 550$ mA per output*
Maximum output current	$\pm 1.3$ A per output*

Protection against  
short-circuits

Rectangular characteristics

\* The indicated current values are valid for each output. It is possible to use the two outputs simultaneously.

### **Various**

Operating temperature

-25, +55 °C (-13 °F, +131 °F)

Storage temperature

-40, +85 °C (-40 °F, +185 °F)

EMC

In compliance with standard EN 55022 A

Weight

2.5 kg (5.51 lb)

Dimensions

90(w) x 115(d) x 200(h)

Connectors

Via 2 RJ 45 sockets.

## **Safety**

The Probe and Power Supply conform to the latest directives concerning safety and electromagnetic compatibility.

- European Low Voltage Directives 73/23/EEC and 93/68/EEC
- European EMC Directives 89/336/EEC and 93/68/EEC

## **Safety Standards**

IEC61010-1:2001. General Requirements.

Safety requirements for electrical equipment for measurement, control and laboratory use.

IEC61010-2-32: 2002. Particular requirements for hand held current clamps for electrical measurement and test.

IEC61010-31: 2002. Particular requirements for hand held Probe assemblies for electrical measurement and test.

300 V rms or dc, overvoltage Cat. I, Pollution degree 1

## **EMC Standards**

RF Susceptibility

EN 50082-1: 1992 3V/m Residential, Commercial and Light Industry

RF Emissions

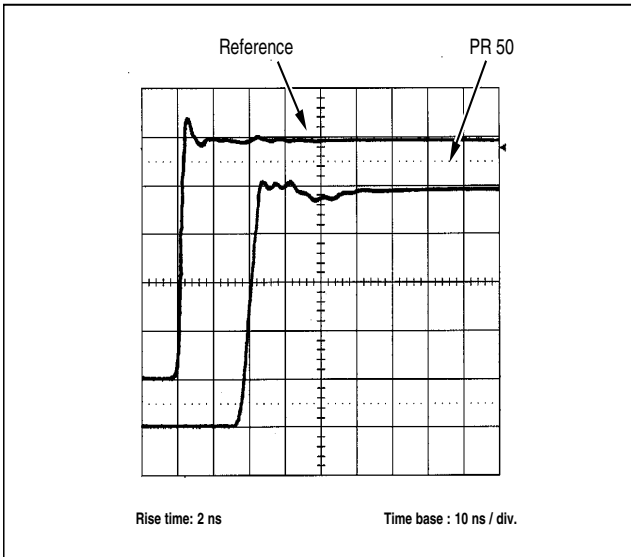
EN 50081-1: 1992 Residential, Commercial and Light Industry

FCC Part 15 Class B

This product is designed to be safe under the following conditions:

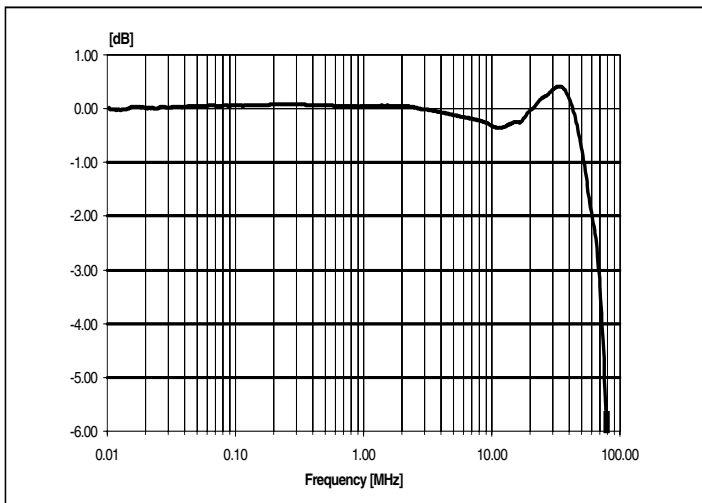
- Indoor use
- Altitude up to 2000 m (6600 ft)
- Temperature 0 °C to +40 °C (32 °F to 104 °F)
- Maximum relative humidity 80 % for temperatures up to 31 °C (87 °F) decreasing linearly to 40 % relative humidity at 50 °C (122 °F)

Use of the Probe on uninsulated conductors is limited to 300 V rms or dc and frequencies below 1 kHz.



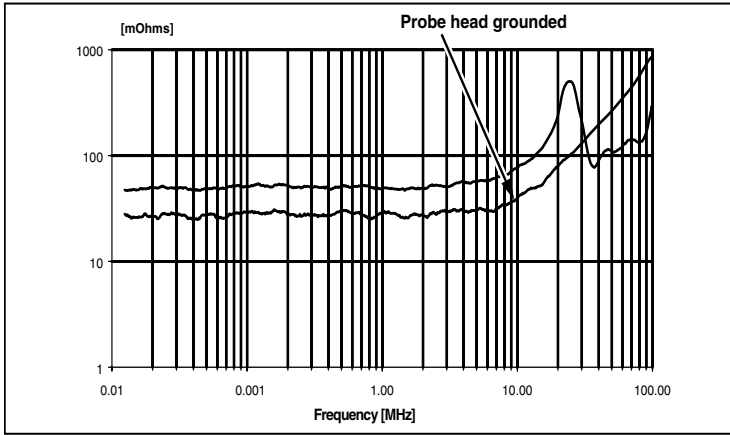
**Figure 5. Step Response**

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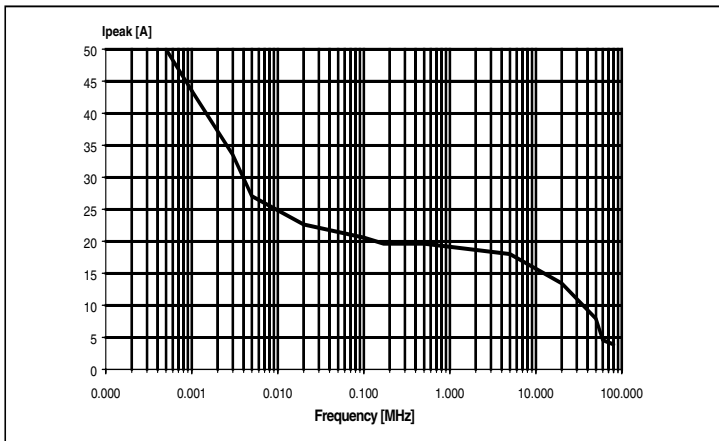
**Figure 6. Frequency Response**

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exi06f.eps

**Figure 7. Insertion Impedance**



exi07f.eps

**Figure 8. Frequency Derating**



## **Accessories**

The following items are supplied with the Probe or the Power Supply.

- Carrying Case (Probe)
- Power Supply Cable (Probe)
- Power Supply Adapter (Probe)
- Grounding Lead (Probe)
- Users Manual (Probe)
- Calibration certificate (Probe)
- IEC Power Cord (Power Supply)
- International Adapters (Power Supply)

## **Service**

If your Current Probe is operated and handled properly, it should not require servicing. However, if you suspect that the Transformer has failed, review this manual to ensure you are operating it correctly. If it still fails to operate properly, pack securely using the original packing material (if available) and forward, postage paid, to the nearest Fluke Service Center. Include a brief description of the problem. Fluke assumes *no* responsibility for damage in transit.

To locate an authorized service center, call Fluke using the phone numbers listed below:

USA: 1-888-99-FLUKE (1-888-993-5853)  
Canada: 1-800-36-FLUKE (1-800-363-5853)  
Europe: +31-402-675-200  
Japan: +81-3-3434-0181  
Singapore: +65-738-5655  
Anywhere in the world: +1-425-446-5500

You may visit us on the World Wide Web at <http://www.fluke.com>.

To register your product, visit <http://register.fluke.com>.