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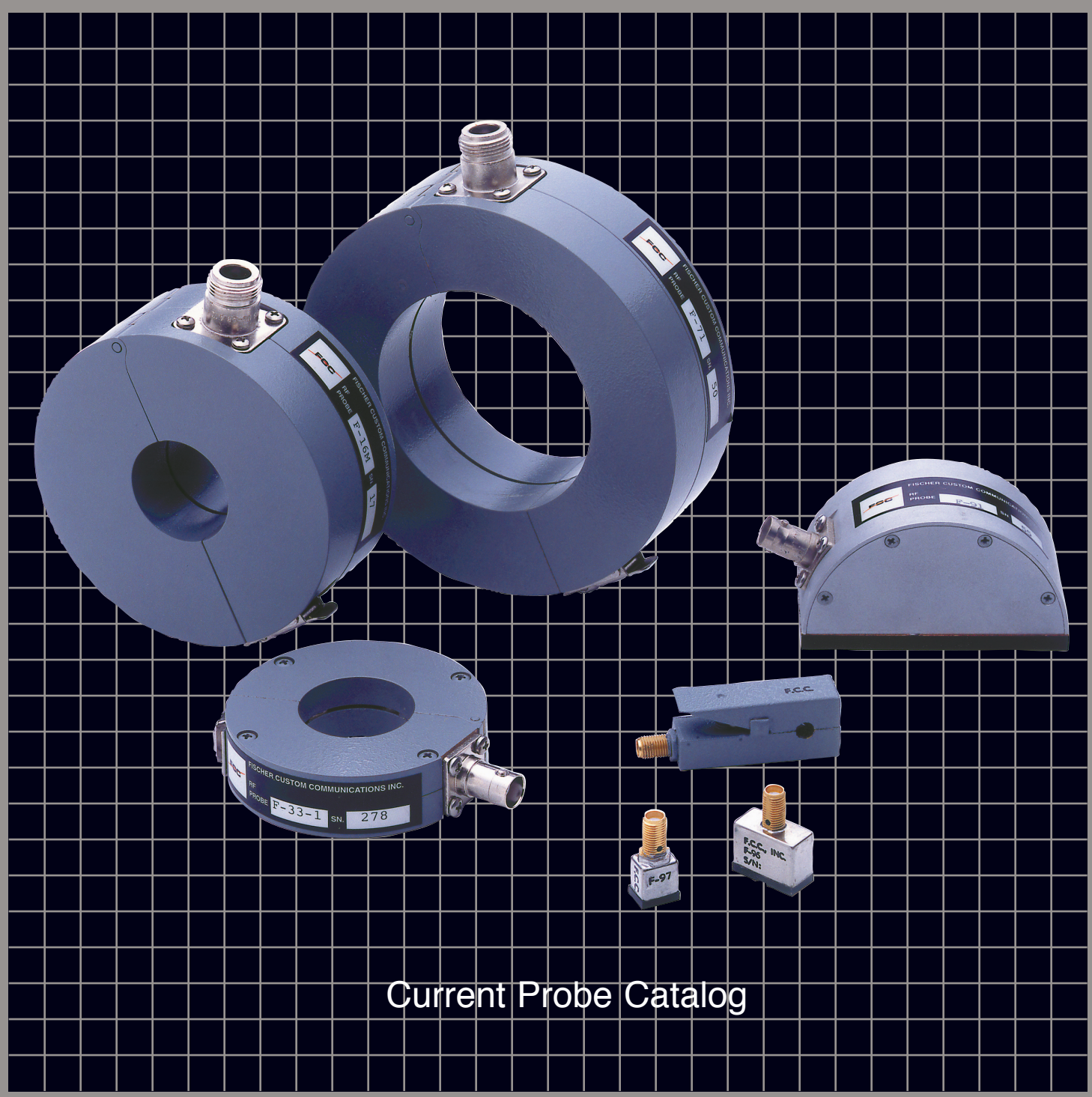
FISCHER CUSTOM COMMUNICATIONS, INC.



Current Probe Catalog

FISCHER CUSTOM COMMUNICATIONS, INC.

Fischer Custom Communications, Inc., is a manufacturer of custom electric and magnetic field sensors for military and commercial applications. Fischer Custom Communications has over 40 years of experience in the design and development of RF current probes and electromagnetic sensors. Over 100 probes have been developed to meet specific customer and compliance testing requirements. Fischer Custom Communications probes are currently being used for compliance testing in accord with MIL-Std-461/462 as well as EMI, ESD and immunity specifications.

APPLICATIONS

The current probe is a special type of RF current transformer used as a RF sensor or monitoring probe. These devices may be used whenever RF current measurements are required. Current measurements are made by placing a current carrying conductor within the "sensing" window of the probe and measuring the probe's output voltage with an RF detector. Calibration of the probe permits the conversion of the voltages measured to current. Current measurements can be made over the frequency range shown in the transfer impedance curve furnished with each probe. There is virtually no loading of the circuit and the technique permits normal operation of the device under test during measurements. This method allows measurement with less VSWR and no special test setup.

There are several different types of current probes, which utilize different geometries to measure current effectively on common as well as unusual metallic structures or conductors. Among the most widely used probes are clamp-on, fixed aperture and surface probes.

The clamp-on probe is composed of two hinged halves that allow the probe to open and close around a conductor under test. This provides the crucial advantage of not having to break open the circuit under test. The aperture can vary between 2.54 mm to 1.2 meters in diameter. Rectangular apertures are available to permit more accurate measurement of flat cable and conductors.

The fixed aperture probe does not open and close like the clamp-on type. It is necessary to break the conductor under test to pass it through the aperture. This type of probe has very wide bandwidths and can be constructed with many different aperture sizes of both circular and rectangular shapes.

The surface probe is a half clamp-on probe with a dielectric cover on the sensing window. The surface probe measures currents on metallic conductors with flat regions such as ground planes, striplines, printed wiring boards, bundles of wire and architectural structures. Surface probes have an insulated base and can be placed in direct contact with conductive surfaces creating minimal disturbance of the current distribution being mapped. The probe's sensitivity is greatest when the magnetic field is orthogonal to the long axis of the probe.

CHOOSING A CURRENT PROBE

When choosing a current probe several electrical and mechanical features require consideration. These include operational bandwidth, transfer impedance or sensitivity, maximum amperage rating for the probe for powerline frequencies, CW and pulse; and finally, the physical dimensions of the probe.

The most important mechanical parameter is the size of the "sensing" window. The sensing window will vary according to the type and size of the RF conductor. For the "clamp-on" and "fixed aperture" probes, the internal diameter of the probe must be able to accommodate the size of the cable or circuit under test. Fischer Custom Communications offers probes with internal diameters ranging from 2.54 mm to 1.2 meters. For the surface probe, the "sensing" window or "footprint" must be smaller than the conductor or circuit under test. By being smaller, the probe can be used to actually "map" the current flow on the surface under investigation. Fischer Custom Communications offers surface probes with sensing footprints of 10 mm square to 89 mm square.

The external size of the probe becomes important if the probe must be placed inside a device during its operation or in some type of fixture.

The usable bandwidth of the probe must overlap the frequency range under evaluation. For example, when measuring digital circuits the usable bandwidth of the probe should include the fundamental frequency of the device under test and at least the 10th harmonic of the fundamental. By analyzing up to and including the 10th harmonic of the fundamental frequency, it is possible to identify the vast majority of the current magnitudes present in the electrical

conductor. This bandwidth will replicate with excellent accuracy the characteristics of a wave shape. For example, a digital circuit having a fundamental frequency of 20 MHz, the usable bandwidth of the current probe at a minimum must be capable of monitoring current up to and including 200 MHz. Since broadband measurements are required for the entire frequency range under evaluation, it is necessary that the probe have as constant a transfer impedance as possible in order to make accurate measurements over the entire frequency range in question.

The sensitivity of the current probe is a function of the transfer impedance. Transfer impedance is defined as the ratio of voltage developed across the output of the probe to the current in the conductor under test $Z_t = E/I$. In order to measure RF currents characterized by small magnitudes, the current probe must have a high transfer impedance. Conversely, measurements of RF currents with large magnitudes are made using a probe with smaller transfer impedance or low sensitivity.

Fischer Custom Communications Inc. calibrates each probe individually and provides a serialized calibration chart.

The current levels on the circuit under test influence the effectiveness of the probe's operation. Each probe has important limitations on the amount of DC, 50 Hz, 60 Hz and 400 Hz as well as CW and pulse RF currents. If the currents on the line under test go beyond these levels the core material used in the probe will most likely saturate.

FOR REVIEW OF THESE CRITICAL PARAMETERS PLEASE SEE "SELECTION GUIDE"

EXTERNAL POWER ABSORBING TERMINATOR

Fischer Custom Communications, Inc. in order to offer current probes with high sensitivity, broad bandwidth as well as high current handling capability, uses an "external power absorbing terminator" in many current probes. Each current probe model equipped with a terminator can be used with or without the terminator. Each configuration is calibrated and used when terminated with a 50 Ω receiver or spectrum analyzer. The transfer impedance with and without the terminator is plotted separately. The basic probe configuration is composed solely of the RF transformer and shield and has the greatest sensitivity for this particular model. For example, the F-72 has a flat transfer impedance of 5 Ω from 500 kHz to 100 MHz (± 2dB). This version without the "External Power Absorbing Terminator" has the advantage of measuring RF currents of small magnitude. The second configuration includes the shielded RF transformer and the "External Power Absorbing Terminator". By adding an external power absorbing terminator the flat region of usable bandwidth is increased and offers a second transfer impedance of less sensitivity. Adding an external power absorbing terminator to the basic F-72 produces a probe with a flat transfer impedance of 0.15 Ω from 10 kHz to 100 MHz. The F-72 with the terminator is a model F-72-1.

The "External Power Absorbing Terminator" has many advantages. By decreasing the sensitivity of the probe, the terminator limits the maximum voltage levels entering the instrumentation, thereby preventing unnecessary damage to spectrum analyzers. Decreasing the sensitivity increases the flat region of the probe's bandwidth. Increasing the flat region of the probe's bandwidth has several benefits. First, having a broader flat region decreases the number of calibration factors required to be entered into automated test instrumentation. Second, it increases the accuracy of pulse transient measurements. The highest frequency of the flat region governs the ability to measure the rise and fall times of a pulse and the lowest frequency of the flat region determines the ability to measure the pulse width.

CAUTION

DO NOT use sensor or monitoring probes as injection probes. Consult FCC, because probes are not necessarily interchangeable and may be damaged by high levels of RF power. This brochure addresses monitoring devices. There is another category of probes, namely, injection probes used for determining susceptibility or immunity characteristics of equipment under test. The injection probes are covered separately in other data sheets.

Fischer Custom Communications, Inc.

Current Probe Selection Guide

PHYSICAL DIMENSIONS (mm) MAXIMUM PRIMARY CURRENT (AMPERES)

Model	Drawing Number	A I.D.	B O.D.	C H_t	Z_t Ω[1]	dB Ω[1]	Connector	DC-60 Hz	400 Hz	RF (CW)	Pulse[2]	Frequency
F - 10	1	32	94	64	0.25	-12	N	350	350	100	100	10 Hz - 2 MHz
F - 10-1	1	32	94	64	0.03	-30	N	100	50	25	500	10 Hz - 2 MHz
F - 10A	1	67	142	53	0.25	-12	N	350	350	100	100	10 Hz - 2 MHz
F - 10A-1	1	67	142	53	0.03	-30	N	100	50	25	500	10 Hz - 2 MHz
F - 12	1	32	94	64	0.32	-10	N	350	350	100	100	10 Hz - 3 MHz
F - 14	1	32	94	64	0.12	-18	N	400	400	50	500	10 Hz - 500 kHz
F - 14 -1	1	32	94	64	0.023	-33	N	400	400	25	500	10 Hz - 500 kHz
F - 14 -C	1	32	98	38	0.03	-30	N	100	50	10	100	10 Hz - 2 MHz
F - 14A	1	67	142	53	0.12	-18.5	N	400	400	50	500	10 Hz - 500 kHz
F - 14A -1	1	67	142	53	0.03	-30.5	N	400	400	25	500	10 Hz - 500 kHz
F - 16	1	32	94	64	4	12	N	400	400	50	300	10 Hz - 70 MHz
F - 16 - 1	1	32	94	64	0.5	-6	N	400	400	3	300	10 Hz - 70 MHz
F - 16A	1	67	142	53	4	12	N	800	400	50	300	10 Hz - 70 MHz
F - 16A -1	1	67	142	53	0.5	-6	N	800	400	3	300	10 Hz - 70 MHz
F - 16M	1	32	98	38	0.5	-6	N	100	100	2	50	100 Hz 50 MHz
F - 33 - 1	1	32	71	19	5	14	BNC*	100	100	10	50	10 kHz 250 MHz
F - 33 - 2	1	32	71	19	1	0	BNC*	100	100	2	50	1 kHz 250 MHz
F - 33 - 3	1	32	71	19	4	12	BNC*	100	100	10	50	1 kHz 200 MHz
F - 33 - 5	3A	20	51	13	1.3	2.3	SMA	25	25	10	50	10 kHz 140 MHz
F - 33 - 6	1	3	19	19	0.8	-2	SMA	5	5	1	10	1 kHz 200 MHz
F - 35	1	32	98	38	1	0	N	350	200	3	100	100 Hz - 100 MHz
F - 35A	1	32	98	38	1	0	N	350	200	3	100	100 Hz - 100 MHz
F - 35 - 1	1	32	98	38	0.15	-16.5	N	350	100	6	500	10 kHz - 100 MHz
F - 40	1	32	98	38	1	0	N	350	350	100	200	100 Hz - 20 MHz
F - 40 -5	1	67	153	102	0.1	-20	N	1000	1000	100	5,000	10 Hz - 50 MHz
F - 42	1	32	98	38	6	15.5	N	350	350	50	100	1 kHz 100 MHz
F - 50	1	32	71	19	9	19	BNC*	300	300	20	50	100 kHz 500 MHz
F - 51	1	32	98	38	10	20	N	350	350	50	100	10 kHz 500 MHz
F - 52	1	40	117	38	10	20	N	350	350	50	100	10 kHz 500 MHz
F - 55	1	32	98	38	1	0	N	350	350	3	100	10 kHz 500 MHz
F - 55A	1	32	98	38	0.1	-20	N	350	350	10	100	1 kHz 500 MHz
F - 61	1	32	71	19	16	24	BNC*	200	200	20	50	1 MHz - 1 GHz
F - 62	1	32	71	19	13	22	BNC*	200	200	20	50	10 MHz - 1 GHz
F - 65	1	32	98	38	1	0	N	350	350	3	100	100 kHz 1 GHz
F - 65A	1	32	98	38	.1	-20	N	350	350	10	100	10 kHz 1 GHz
F - 70	1	70	125	38	1	0	N	350	350	3	100	1 kHz - 100 MHz
F - 71	1	70	125	38	8	18	N	200	200	25	50	10 kHz - 500 MHz
F - 72	1	67	142	53	5	14	N	350	350	100	100	100 Hz 100 MHz
F - 72 -1	1	67	142	53	0.15	-16	N	350	150	12	500	100 Hz 100 MHz
F - 72 -2	1	67	142	53	0.005	-46	N	200	70	60	5,000	100 Hz 100 MHz
F - 73	1	67	142	53	2	6	N	350	350	200	200	10 Hz 30 MHz
F - 75	1	70	125	38	1	0	N	350	350	3	100	10 kHz - 500 MHz
F - 80	1	127	197	41	5	14	N	350	350	100	100	1 kHz - 100 MHz
F - 80 - 1	1	127	197	41	1	0	N	350	350	2	100	1 kHz - 100 MHz
F - 81	1	127	197	41	1	0	N	350	350	100	100	100 Hz 10 MHz
F -2000	1	13	37	17	16	24	SMA	100	100	10	50	10 MHz - 3 GHz

PHYSICAL DIMENSIONS (mm) MAXIMUM PRIMARY CURRENT (AMPERES)

Model	Drawing Number	A	B	C	D	E	Z_t Ω[1]	dB Ω[1]	Connector	DC-60 Hz	400 Hz	RF (CW)	Pulse[2]	Frequency
F-32-9B	4		6	152	46	28	121		3.2 SMA10	100	100	10		100 100 kHz - 300

*Type N and SMA optional

Clip-on Miniature Probes

PHYSICAL DIMENSIONS (mm) | MAXIMUM PRIMARY CURRENT (AMPERES)

Model	Drawing	A	B	C	D	Z_t Ω[1]	dB Ω[1]	Connector	DC-60 Hz	400 Hz	RF (CW)	Pulse[2]	Frequency
F-36-1	5		5 54	13	19		4	12 SMA	20	20	1	10	10 kHz - 200 MHz
F-36-2	5		5	54	13	19	1	0	SMA 20	20	1	10	1 kHz - 200 MHz
F-36-4	5		5	54	13	19	22	27	SMA 20	20	1	10	1 MHz - 1 GHz

Skin Current Probes

PHYSICAL DIMENSIONS (mm) | MAXIMUM PRIMARY CURRENT (AMPERES)

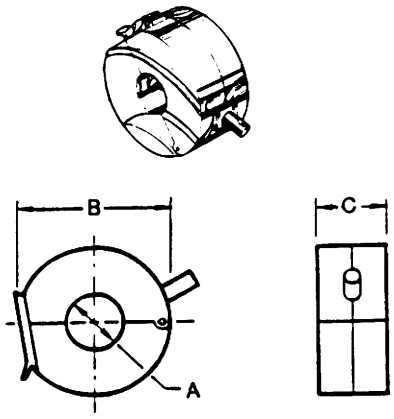
Model	Drawing Number	A	B	C	Z_t Ω[1]	dB Ω[1]	Connector	DC-60 Hz	400 Hz	RF (CW)	Pulse[2]	Frequency
F-90	2	89	51	38	0.08	- 22	N	5000	300	10	200	10 kHz - 1 MHz
F-91	2	89	51	38	1.4	3	N	5000	300	20	200	1 MHz - 100 MHz
F-92	2	76	44	38	0.9	- 1	BNC	5000	300	10	200	10 MHz - 400 MHz
F-96	2	19	13	10	1.26	2	SMA	10	10	10	100	1 MHZ - 450 MHz
F-97	2	10	13	8	0.45	- 7	SMA	10	10	10	100	10 MHz - 1.5 GHz

1. Probes calibrated with 50 Ω ± j0 Ω Load Impedance

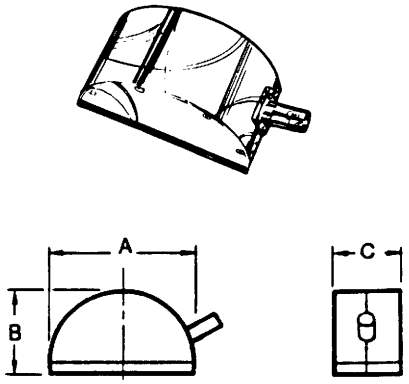
2. Depends upon the pulse width and pulse repitition rate

Current Probe Mechanicals

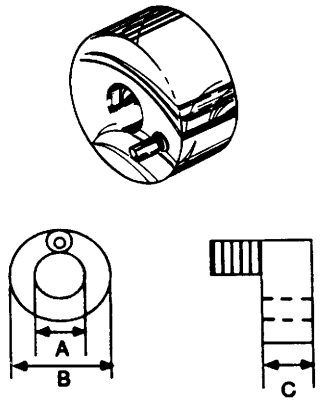
Clamp On Probe
Drawing #1



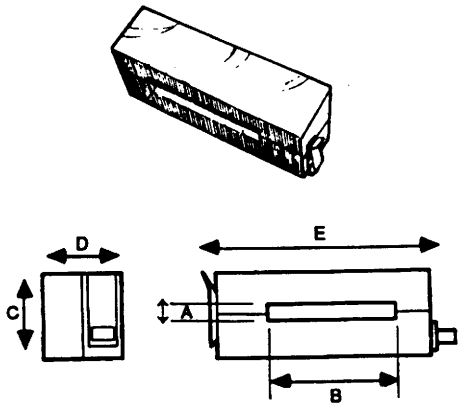
Surface Probe
Drawing #2



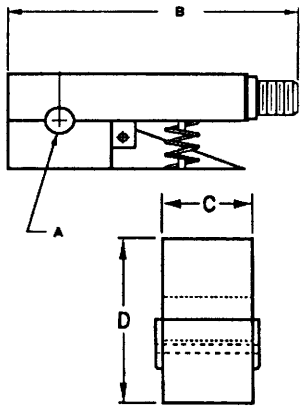
Fixed Aperture Probe
Drawing #3A



Current Probe F-32-9B
Drawing #4



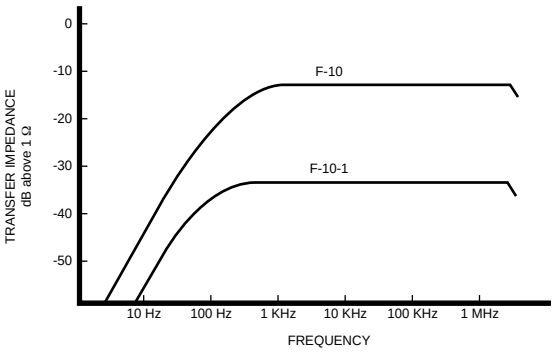
Clip-on Miniature Probe
Drawing #5



F-10 Series Current Probe

The F-10 is used to measure currents on 50 Hz, 60 Hz and 400 Hz power lines. A power absorbing terminator is used (see APPLICATIONS section) to offer high sensitivity with broad bandwidth and high current handling capability. The basic F-10 current probe has a transfer impedance of 0.25 Ω (± 2 dB) from 2 kHz to 2 MHz. The F-10-1 includes the power absorbing terminator and has a transfer impedance of 0.03 Ω (± 2 dB) from 300 Hz to 2 MHz. The F-10 has a usable frequency range overlapping the fundamental powerline frequencies. The F-10 can handle 350 amperes of primary power line current from DC to 400 Hz without saturation.

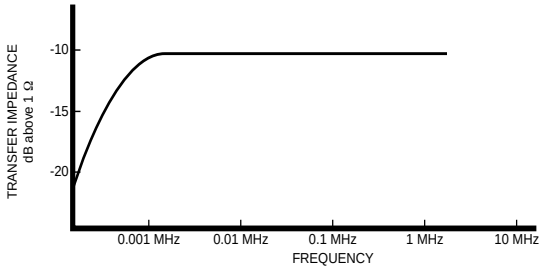
F-10,F-10-1



F-12 Series Current Probe

The F-12 measures currents on 400 Hz powerlines. This probe has a usable frequency range of 10 Hz to 3 MHz with a transfer impedance from 0.33 Ω (± 2 dB) 500 Hz to 3 MHz. Primary power currents of 350 amps DC to 400 Hz will not alter the transfer impedance. The probe can be used to measure conducted emmisions and investigate low level harmonics.

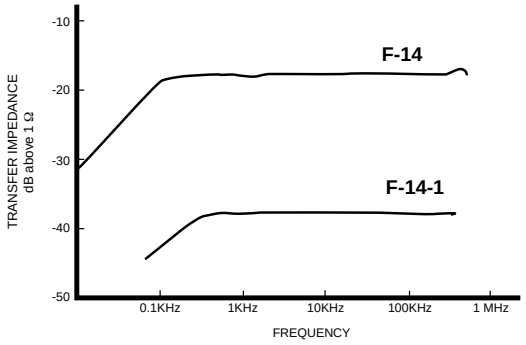
F-12



F-14 Current Probe

The F-14 measures currents on 50 Hz, 60 Hz and 400 Hz powerlines. All the F-14 current probes except the F-14-C have a usable frequency range of 10 Hz to 500 kHz. A power absorbing terminator can be added to provide a high quality blend of high sensitivity, power handling capability and broad bandwidth. The basic F-14 curent probe has a flat transfer impedance of 0.12 Ω (± 2 dB) from 100 Hz to 500 kHz. The F-14-1 with a power absorbing terminator has a transfer impedance of 0.025 Ω (± 2 dB) from 30 Hz to 500 kHz. The F-14 and the F-14-1 can operate up to 400 amperes of primary powerline currents DC to 400 Hz without saturating the probe. Custom variations of the probe are available. The primary difference between these custom versions of the probes is the specific location of the flat region of the bandwidth.

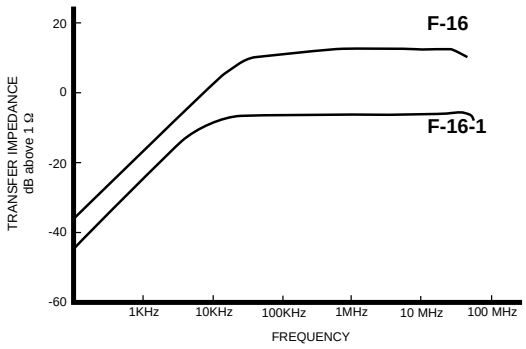
F-14, F-14-1



F-16 Current Probe

The F-16 is used to measure conducted emissions from 10 kHz to 50 MHz. It has a usable frequency range of 10 Hz to 70 MHz. The basic F-16 probe has a transfer impedance of 4 Ω (± 2 dB) from 30 kHz to 50 MHz. The F-16-1 with the power absorbing terminator has a constant transfer impedance of 0.5 Ω (± 2 dB) from 4 kHz to 50 MHz. All configurations of the F-16 probe can handle 400 amperes of primary powerline currents from DC to 60 Hz without saturating or impacting the transfer impedance of the probe except the F-16M.

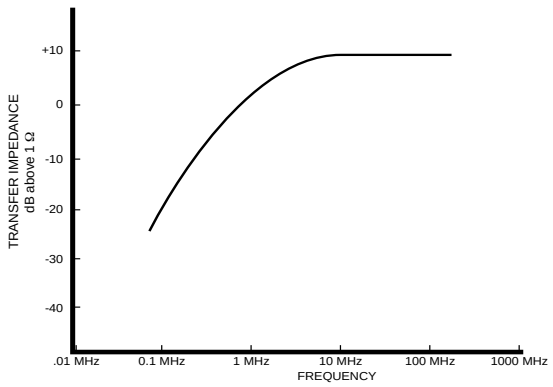
F-16, F-16-1



F-32-9B Current Probe

The F-32-9B has an aperture which will accept a flat, ribbon or multiple conductors molded into a flat cable. Dimensions of the aperture are 6.35 mm high by 152.4 mm wide. The sensor is capable of performing with pulse currents of 100 amperes having a duty cycle of 0.001 and 100 amps of DC to 400 Hz powerline current. The probe has a usable frequency of 10 kHz to 300 MHz. The flat region of transfer impedance is approximately 3 Ω from 10 MHz to 300 MHz.

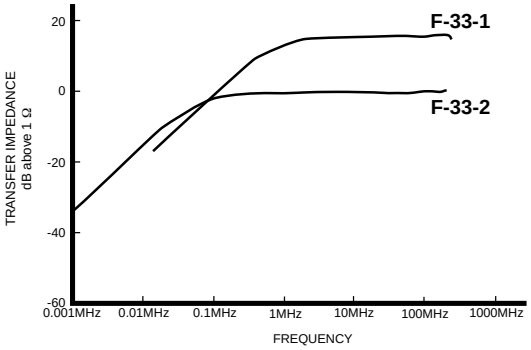
F-32-9B



F-33 Current Probe

The F-33 is for laboratory and field testing. These probes have a small outer diameter, approximately 71 mm with an internal diameter of 32 mm. The usable frequency range of the series is from 1 kHz to 250 MHz. The F-33-1 has a typical transfer impedance of 5 Ω (± 2 dB) over the frequency range of 5 MHz to 250 MHz. The RF current range is 10 amperes CW and 50 amperes peak with a duty cycle of 0.1. The maximum primary powerline current is 100 amperes from DC-400 Hz. The F-33-2 has similar dimensions to the F-33-1 and has a nominal transfer impedance of 1 Ω from 150 kHz to 250 MHz (± 2 dB). The model F-33-2 handles 2 amperes CW, 50 amperes pulse and 100 amperes DC to 400 Hz.

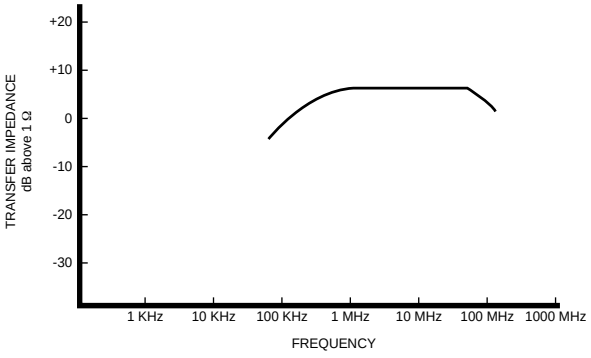
F-33-1, F-33-2



F-33-5 Fixed Aperture Current Probe

The F -33-5 is ideal for measuring currents of charged particle beams and can be used in small diameter high vacuum chambers. The outer diameter is 50.8 mm with an aperture diameter of 20 mm. The small impedance added to the beam, negligible phase shift and broad flat transfer impedance permits measurement of the exact current and its waveform. The bandwidth for a 3 dB variation in the transfer impedance is 100 kHz to 140 MHz, and the typical transfer impedance is 1.3 Ω. It is capable of measuring 10 amperes of CW current and 50 amperes of pulse current with a duty cycle of 0.1.

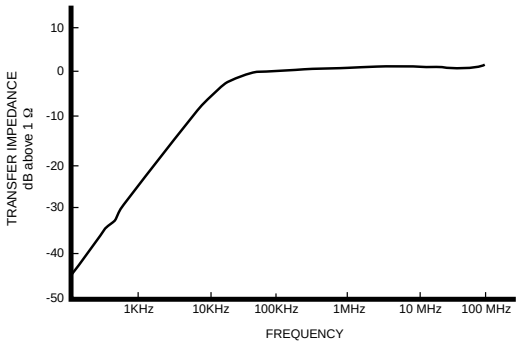
F-33-5



F-35 Current Probe

The F-35 has a transfer impedance of 1 Ω (± 2 dB) from 100 kHz to 100 MHz. The probe is capable of measuring pulse currents to 100 amperes with a duty cycle of 0.001. It will not saturate when clamped around a conductor carrying 350 amperes of DC to 60 Hz and 200 amperes of 400 Hz powerline current.

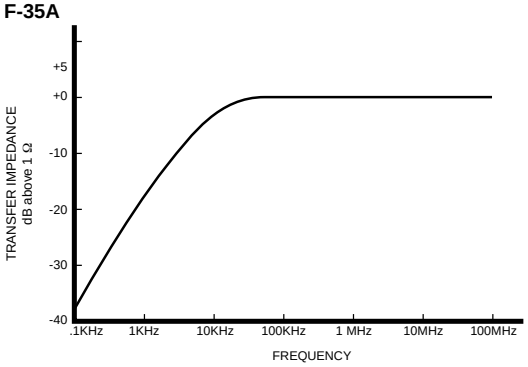
F-35



F-35A Current Probe

The F-35A can be used from 10 Hz to 100 MHz and has a typical transfer impedance of 1 Ω (±2 dB) between 10 kHz to 100 MHz. It can operate without saturation from 3 amp CW and 100 amp peak pulse. The probe's flat bandpass allows measurement of pulse currents with risetimes of 3.5 nanoseconds and pulse widths of 3.5 microseconds. It is particularly suited to the measurement of damped sinusoid between 10 kHz and 100 MHz.

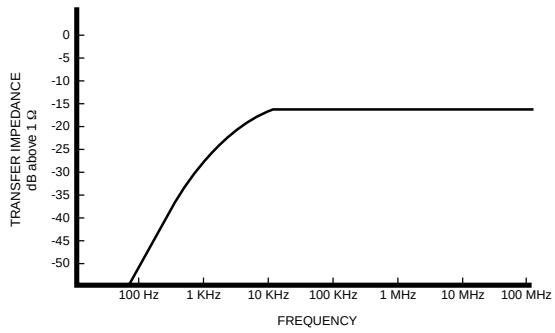
F-35A



F-35-1 Current Probe

The F-35-1 has a transfer impedance of approximately 0.15 Ω (±2 dB) from 30 kHz to 100 MHz. The probe is capable of performing without saturation when measuring pulsed currents to 500 amperes and a duty cycle of 0.001 and 350 amperes of DC to 60 Hz and 100 amperes of 400 Hz powerline current.

F-35-1



F-36 Current Probe Series

The F-36 series probes with their small overall sizes and broad bandwidth sensitivity are ideally suited for making current measurements on cables and circuits inside equipment under test. These probes cover a range of 1 kHz to 1000MHz. The F-36 series spring-loaded clip makes for easy attachment to the circuit under test.

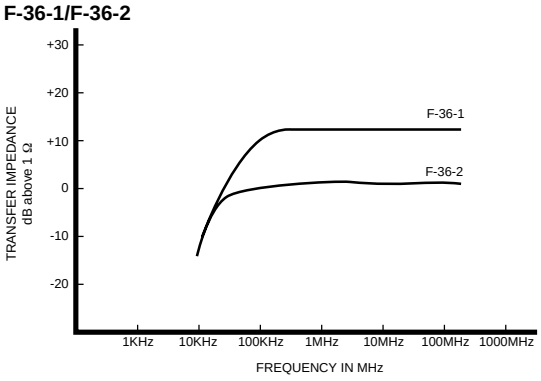
F-36-1 Current Probe

The F-36-1 is usable from 10kHz to 200 MHz with a transfer impedance of 4 Ω (±2 dB) from 200 kHz to 200 MHz. It can operate without saturation from 1 amp CW and 10 amps pulse.

F-36-2 Current Probe

The F-36-2 is usable from 1 kHz to 200 MHz with a transfer impedance of 1 Ω (±2 dB) from 40 kHz to 200 MHz. It operates without saturation from 1 amps CW and 10 amps pulse. The F-36-2, with its broad flat bandpass, can measure pulse currents with risetimes of 1.5 nanoseconds and pulse widths of 1 microsecond.

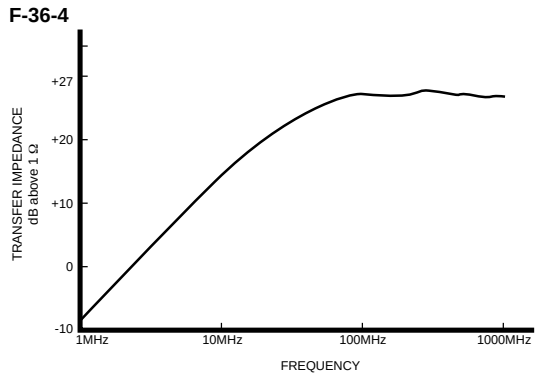
F-36-1/F-36-2



F-36-4 Current Probe

The F-36-4 is usable from 1 -1000 MHz with a transfer impedance of 22 Ω (±3 dB) from 30 - 1000 MHz. It can operate without saturation from 1 amp CW and 10 amps peak pulse.

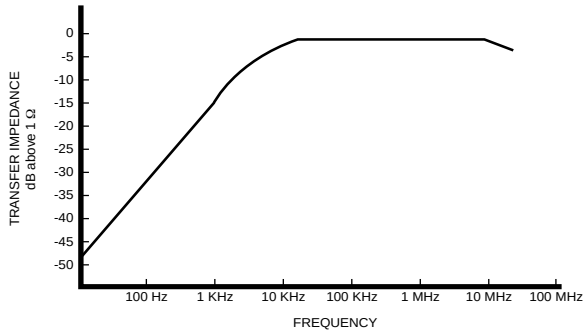
F-36-4



F-40 Current Probe

The F-40 has a typical transfer impedance of 1Ω (± 2 dB) over the frequency range of 10 kHz to 20 MHz. The probe will not saturate when clamped around conductors carrying 350 amperes of DC to 400 Hz, 100 amperes of CW and 200 amperes of pulse currents. It has a usable frequency range of 10 Hz to 20 MHz.

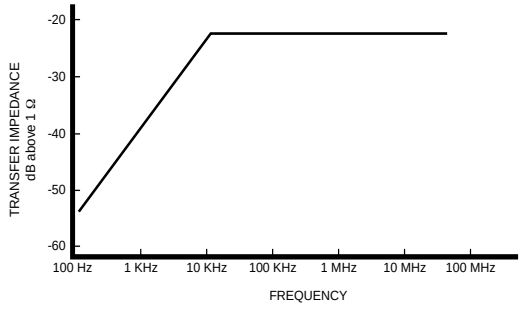
F-40



F-40-5 Current Probe

The F-40-5 current probe has been specifically designed to measure very large amperage transients having pulse widths of 100 microseconds. It is capable of measuring 5,000 amperes with a pulse shape of a damped sinusoid half cycle of 10 kHz. A 10,000 ampere version is available upon request. The probe is calibrated for a frequency range of 10 Hz to 50 MHz. The transfer impedance is typically 0.1 Ω over the range of 10 kHz to 50 MHz.

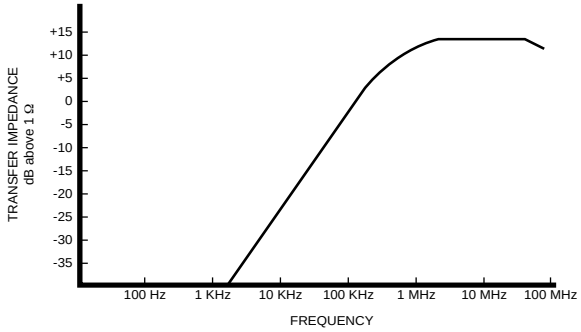
F-40-5



F-42 Current Probe

The F-42 has a usable frequency range of 1 kHz to 100 MHz. Its transfer impedance is typically 6 Ω (± 2 dB) from 3 MHz to 80 MHz. It operates without saturation for currents from 350 amperes of DC to 400 Hz, 100 amperes of pulse current and 50 amperes of CW.

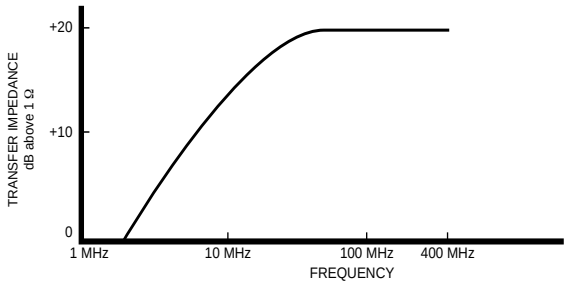
F-42



F-50 Current Probe

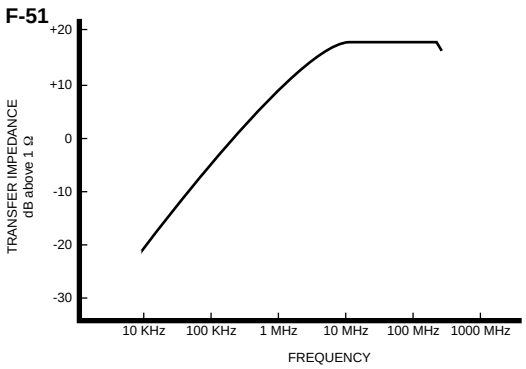
The F-50 is usable from 100 kHz to 500 MHz with a typical transfer impedance of 9 Ω (± 2 dB) from 50 MHz to 400 MHz. It can operate without saturation from 300 amperes of DC to 400 Hz, 50 amperes of pulse current and 20 amperes of CW.

F-50



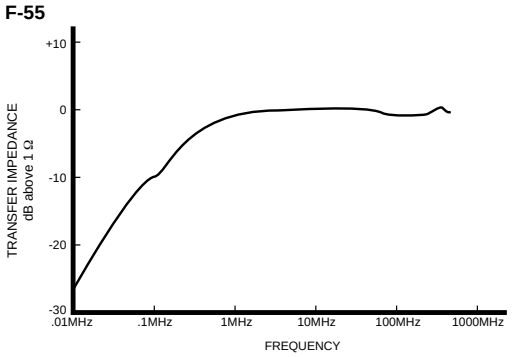
F-51 Current Probe

The F-51 is usable from10 kHz to 500 MHz. Its transfer impedance is typically 10 Ω (± 2 dB) from 10 MHz to 500 MHz. It will not saturate up to 350 amperes of DC to 400 Hz, 100 amperes of pulse currents and 50 amperes of CW.



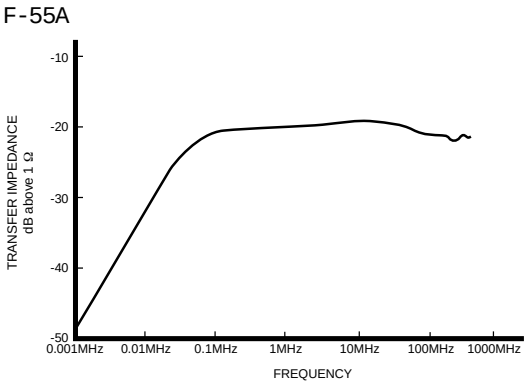
F-55 Current Probe

The F-55 is usable from 10 kHz to 500 MHz and has a typical transfer impedance of 1 Ω (± 3 dB) between 700 kHZ to 500 MHz. It can operate without saturation from 100 amps peak pulse and 3 amps CW. It is capable of measuring pulse transients with risetimes of 800 picoseconds and a pulse width of 35 nanoseconds.



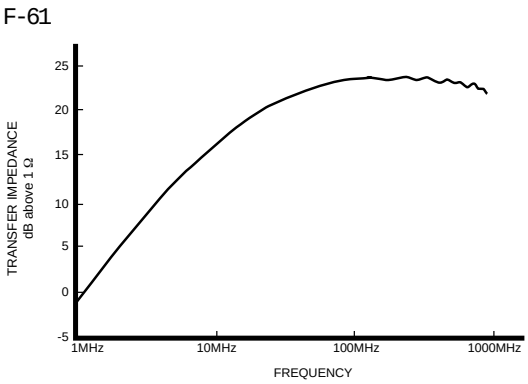
F-55A Current Probe

The F-55A current probe can be used from 1 kHz to 500 MHz and has a typical transfer impedance of 0.1 Ω (± 3 dB) from 100 kHz to 500 MHz. It can operate without saturation from 100 amps pulse current and 10 amps CW. The F-55A can be used to measure pulse transients with risetimes of 800 picoseconds and pulse width of 3 microseconds.



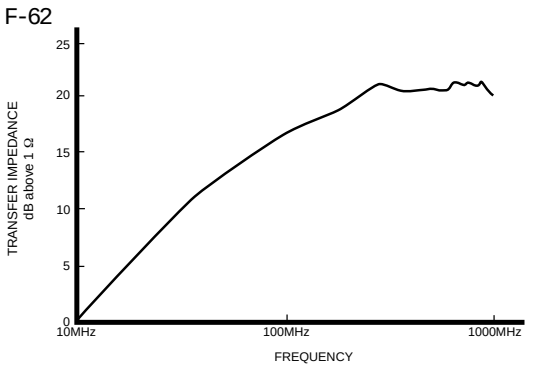
F-61 Current Probe

The F-61 is used from 1 MHz to 1 GHz, and has a typical transfer impedance of 22 Ω (± 2 dB) from 100 MHz to 900 MHz. It can operate without saturation from 200 amperes of DC to 400 Hz, 50 amperes of pulse current and 20 amps of CW.



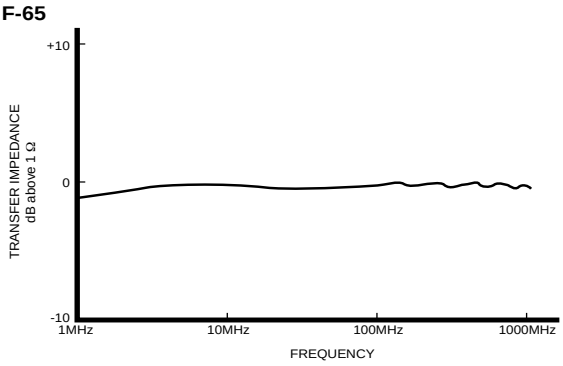
F-62 Current Probe

The F - 62 is used to measure very small currents in the 200 MHz to 1 GHz range. It can be used from 10 MHz to 1 GHz. Its maximum transfer impedance is 13 Ω from 350 MHz to 750 MHz. It can operate without saturation from 200 amperes of DC to 400 Hz, 50 amperes of pulse current and 20 amperes of CW.



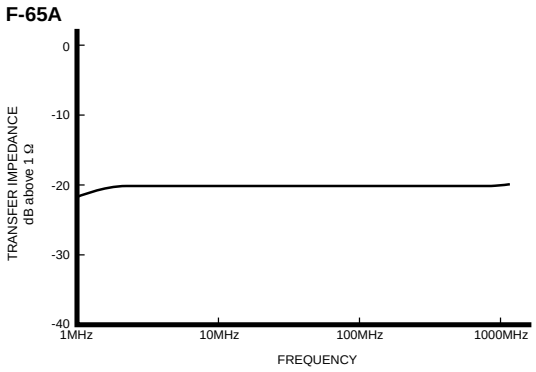
F-65 Current Probe

The F-65 current probe can be used from 100 kHz to 1000 MHz and has a typical transfer impedance of 1 Ω (± 3 dB) from 1 MHz to 1000 MHz. It can operate without saturation from 100 amps of pulse current and 3 amps CW. With its flat broadpass, the F-65 is ideally suited to measure transients with risetimes of 200 picoseconds and pulse widths of 35 nanoseconds.



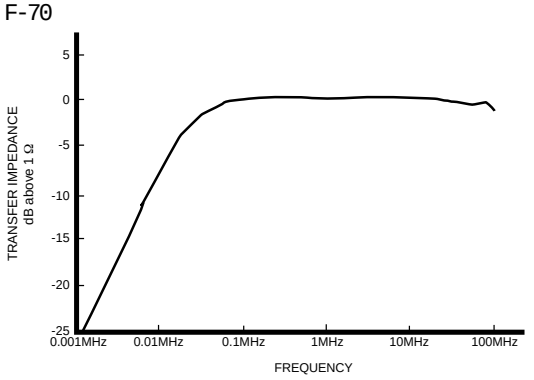
F-65A Current Probe

The F-65A current probe can be used from10 kHz to 1000 MHz and has a typical transfer impedance of 0.1 Ω (± 3 dB) from 100 kHz to 1000 MHz. It can operate without saturation from 100 amps peak pulse current and 10 amps CW. The F-65 can be used to measure pulse transients with risetimes of 200 picoseconds and pulse widths as long as 0.3 microseconds.



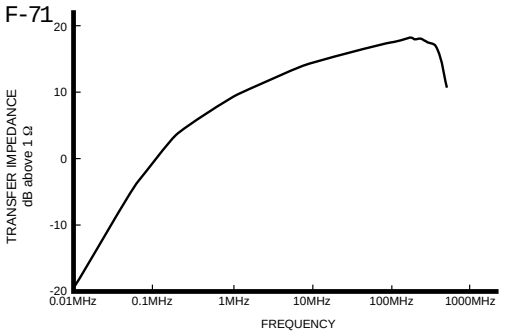
F-70 Current Probe

The F-70 measures high power pulse currents such as those associated with EMP waveshapes. It clamps around large conductors or bundles of wire and has an aperture of 69.85 mm. It has a usable frequency range of 1 kHz to 100 MHz. Its transfer impedance is typically 1 Ω (± 2 dB) from 50 kHz to 100 MHz. It operates without saturation from 350 amperes of DC to 400 Hz, 100 amps of pulse current and 3 amperes of CW.



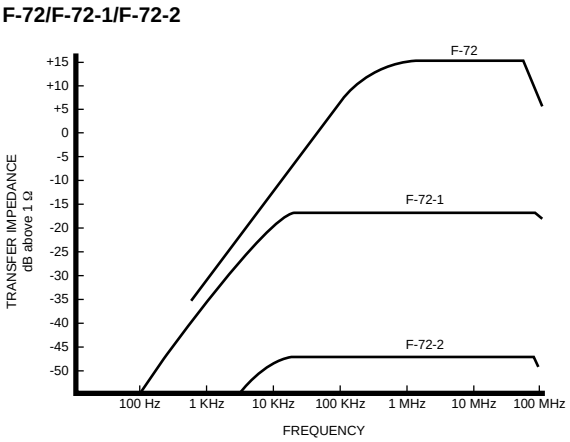
F-71 Current Probe

The F-71 is ideally suited to measuring currents for the immunity requirements of DO-160 and IEC-1000-4-6 on large cables. It has a usable frequency range of 10 kHz to 500 MHz. Its transfer impedance is typically 8 Ω (± 2 dB) from 70 MHz to 400 MHz. It has an aperture of 69.85 mm and can clamp around very large cable bundles. It can operate without saturation from 200 amperes of DC to 400 Hz, 50 amperes of pulse current and 25 amperes of CW.



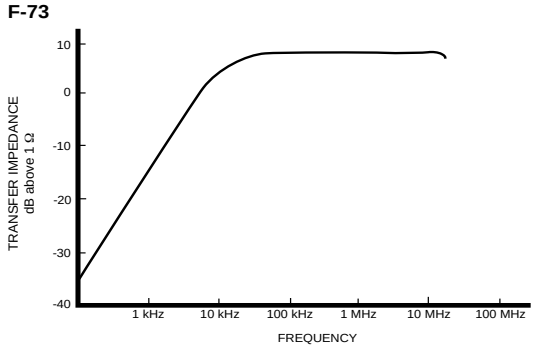
F-72 Current Probe Series

The F-72 is a versatile probe and uses the external power absorbing terminator. The series has a usable frequency range of 100 Hz to 100 MHz. The basic F-72 has a transfer impedance of 5 Ω (±2 dB) from 500 kHz to 100 MHz. It can operate without saturation up to 350 amperes from DC to 400 Hz, 100 amperes CW and 100 amperes pulse currents. The model **F-72-1** probe equipped with an external terminator has a transfer impedance of 0.15 Ω (±2 dB) from 10 kHz to 100 MHz. 350 amperes of DC to 60 Hz, 150 amperes 400 Hz, 12 amperes CW and 500 amperes pulse will not alter the transfer impedance. The **F-72-2** has a transfer impedance of 0.005 Ω from 10 kHz to 100 MHz. Primary power currents of 200 amperes DC to 60 Hz, 70 amperes 400 Hz and 60 amperes CW and 5,000 amperes pulse will not alter the transfer impedance. This probe can be used to measure small RF currents in the basic configuration and pulse currents with wide ranging magnitudes in the other variations.



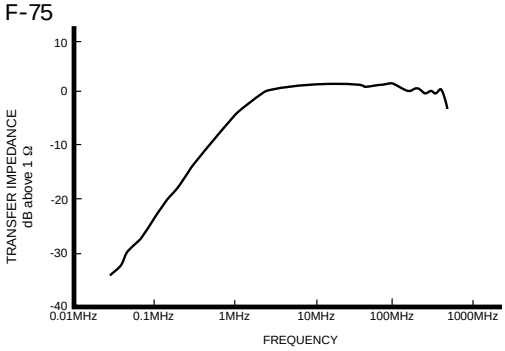
F-73 Current Probe

The F-73 monitor probe can be used from 10 Hz to 30 MHz and has a typical transfer impedance of 2 Ω (±3 dB) from 10 kHz to 30 MHz. It can operate without saturation from 350 amps primary current at 400 Hz and 200 amps CW. The F-73 is particularly useful in making conducted emissions measurements on high amperage powerline cables.



F-75 Current Probe

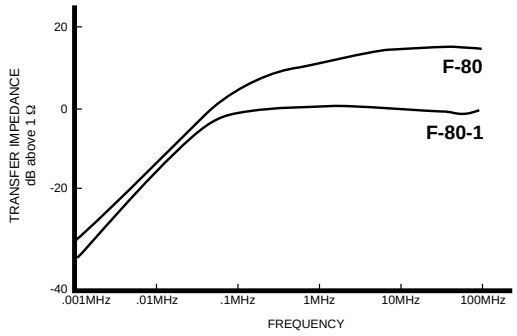
The F-75 is usable from 10 kHz to 500 MHz and has a transfer impedance of 1 Ω (±3 dB) from 700 kHz to 500 MHz. It can be used to measure pulse currents up to 100 amps in magnitude with 800 picosecond risetimes and pulse widths of 40 nanoseconds. The probe has the advantage of being equipped with a large aperture of 70 mm.



F-80 Current Probe Series

The model F-80 is ideal for measurements from 1 kHz to 100 MHz on large pipes, bundles of cables, or architectural conductive structures. The aperture is 127 mm. The transfer impedance is 5 Ω (± 3dB) from 500 kHz to 100 MHz. It can be used without saturating up to 350 amperes of DC to 400 Hz, 100 amperes of CW or pulse current. By adding an external power absorbing terminator to the output the model number becomes **F-80-1** with a typical transfer impedance of 1 Ω (± 2dB) from 100 kHz to 100 MHz. It can operate without saturation from up to 350 amperes of DC to 400 Hz, 2 amperes of CW current, and 100 amperes of pulse current.

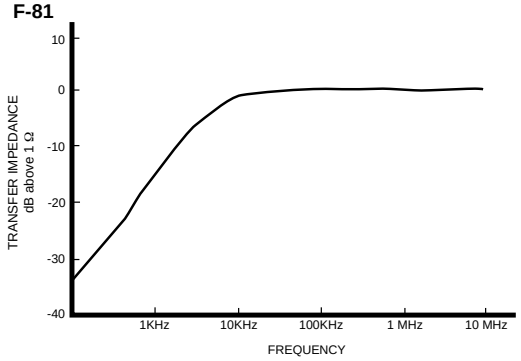
F-80, F-80-1



F-81 Current Probe

The model F-81 is optimized to measure low frequency currents on large pipes, bundles of cables, or architectural conductive structures. The aperture is 127 mm. The usable frequency range is 100 Hz to 10 MHz with a typical transfer impedance of 1Ω (± 2dB) from 10 kHz to 10 MHz. The F-81 can be used without saturating up to 350 amperes of DC to 400 Hz, 100 amperes of CW, or 100 amperes of pulse current.

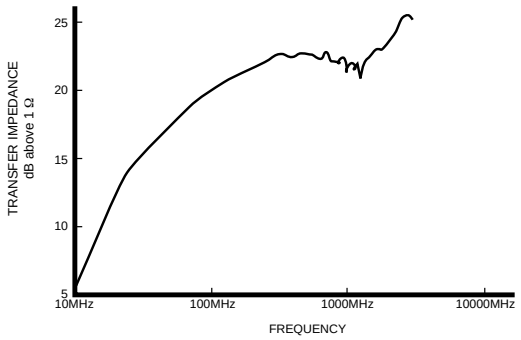
F-81



F-2000 Current Probe

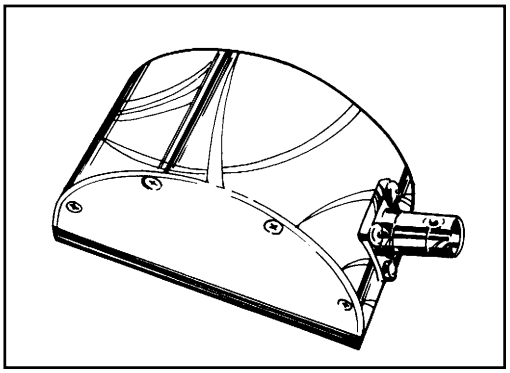
The F-2000 is usable from 10 MHz to 3000 MHz and has a typical transfer impedance of 16 Ω (±3 dB) from 300 MHz to 3000 MHz. It can operate without saturation from 50 amps peak pulse and 10 amps CW. The F-2000 is the first clamp-on probe capable of making current measurements beyond 1200 MHz.

F-2000

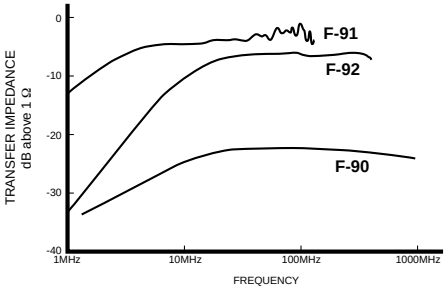


SKIN CURRENT PROBES

F -90 Series of Skin Current Probes

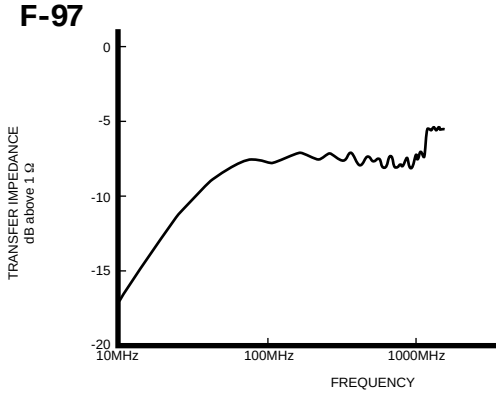


The F-90 series of current probes are used to measure currents flowing on flat or curved surfaces. The shielding effectiveness of a structure, case or housing can be determined by measuring the currents flowing on the inner and outer surfaces of the structure. Each probe is calibrated and can be used to locate the leakage points on a surface. The probe is highly sensitive to the direction of the current flow allowing the surface currents on a structure to be completely mapped. The probe sensitivity is maximized when the axis of the probe is perpendicular to the current flow. Surface probes are composed of a dielectric base to raise it above the surface reducing the disturbance of the current flowing in the surface to less than 10 percent. Surface probes can operate in radiated fields up to 100 volts per meter without significant interference from case leakage. The sensing circuit of the surface probe is well shielded by its case. The Model F-90 has a transfer impedance of 0.08 Ω (±2 dB) from 10 kHz to 1 MHz. **Model F-91** has a transfer impedance of 1.4 Ω (±2 dB) from 5 MHz to 100 MHz, and the **Model F-92** is usable from 40 MHz to 400 MHz with a typical transfer impedance of 0.9 Ω (±2 dB). Primary powerline currents of 5000 amperes will not alter the transfer impedance characteristics. Models F-90 and F-91 have a type N connector, are 38.1 mm wide, 88.9 mm long and 50.8 mm high. The F-92 has a BNC connector and is 38.1 mm wide, 76.2 mm long and 44.45 mm high.



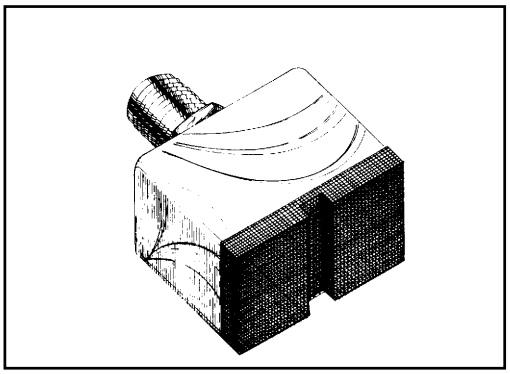
Model F-97 Miniature Skin Current Probe

The F-97 skin current probe permits quantitative measurements of currents flowing on flat or curved surfaces, wires, and printed circuit board traces. Surface currents can be mapped quickly and easily because the probe is sensitive to the direction of skin current flow. The maximum sensitivity is in the direction perpendicular to the current flow. RF currents flowing on printed wiring boards can be easily mapped for the sources of emissions, their magnitudes, and currents in traces. The probe can be calibrated for the current under the footprint of an enclosure or surface. A surface is mapped by orienting the probe for its maximum sensitivity and then repeating the measurement after moving the probe to the next location. The dielectric base minimizes the probes disturbance to normal current flow to 10% or less. The transfer impedance has a 3 dB bandwidth of 40 MHz to 1,500 MHz with a magnitude of 0.45 Ω when used as a surface probe. It is usable to lower frequencies with reduced sensitivity. A typical transfer impedance curve is shown. CW current amplitudes up to 10 amperes and pulse currents up to 100 amperes will not alter the transfer impedance characteristics. The probe connector is SMA. The probe dimensions are 7.62 mm wide, 10.16 mm long, and 12.7 mm high.

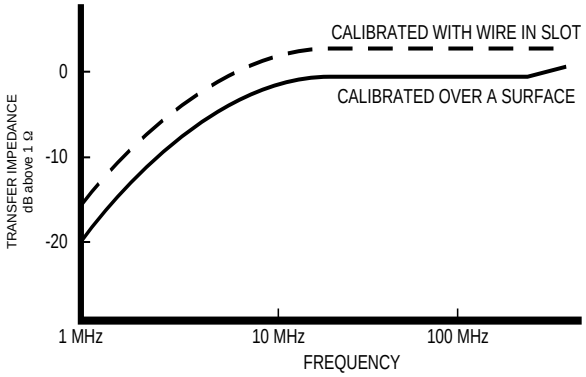


Model F-96 Miniature Skin Current Probe

The F-96 skin current probe permits quantitative measurements of currents flowing on flat or curved surfaces, wires, and printed circuit board traces. Surface currents can be mapped quickly and easily because the probe is sensitive to the direction of skin current flow. The maximum sensitivity is in the direction perpendicular to the current flow. RF currents flowing on printed wiring boards can be easily mapped for the sources of emissions, their magnitudes, and currents in traces. The probe can be calibrated for the current under the footprint of an enclosure or surface. A surface is mapped by orienting the probe for its maximum sensitivity and then repeating the measurement after moving the probe to the next location. A notch is provided in the dielectric base of the the probe for calibration of currents flowing in a wire or a circuit board trace. Current in a wire is measured when the wire is placed in the notch. The current in a circuit board trace is measured when the trace is located directly beneath the notch. The dielectric base minimizes the probes disturbance to normal current flow to 10% or less. The transfer impedance has a 3 dB bandwidth of 8 MHz to 450 MHz with a magnitude of 1.26 Ω when used as a surface probe. It is usable to lower frequencies with reduced sensitivity. Typical transfer impedance curves are shown at the right for both a surface and a wire. CW current amplitudes up to 10 amperes and pulse currents up to 100 amperes will not alter the transfer impedance characteristics. The probe connector is SMA. The probe dimensions are 10.2 mm wide, 20.3 mm long, and 25.4 mm high.



F-96



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