

CT Current Transformer



The Bergoz Instrumentation Current Transformer (CT) provides an accurate, non destructive (non contact), measurement of single or repetitive unipolar or bipolar pulses, or continuous wave.

The product range offers the measurement of currents from micro-amps to 20K amps, at frequencies ranging from 0.5 Hz to 500 MHz.

The output signal of the transformer is an accurate voltage waveform representation of the measured current, which can be analyzed on an oscilloscope, RF power meter, spectrum analyzer or custom interface circuitry.

Offering superior performance and quality, the transformers are available in 4 case sizes, can be terminated with BNC or SMA connectors and offer a sensitivity range providing environmental application flexibility.

All transformers can be shipped with certificate of calibration and factory test data, ensuring optimum levels of performance are realized.



Application and industrial sectors include :

- **Laser and Plasma research**
- **EMC and EMI research**
- **Semiconductor gate switching**
- **Power system harmonics and transients**
- **Lightning research and simulation testing**
- **Capacitor and electrostatic discharges**
- **Corona wire discharge**
- **Partial Discharge measurement**
- **Critical monitoring of current fluctuations**

Higher frequency

Higher sensitivity

Higher temperature

More accuracy

Bergoz Instrumentation Current Transformers offer key advantages over competing products:

- Higher frequency cutoff, assuring faithful rendering of fast transients
- Up to 5 times more sensitive for low intensity signal measurement
- Operating temperature -20°C to +120°C
- Higher nominal accuracy $\pm 0.5\%$, over a wider bandwidth

Bergoz International welcome the opportunity to discuss your application requirements, offer advice and propose solutions. Should your needs fall out with our standard product specifications, we would be pleased to discuss the potential of custom solutions.

Distributors

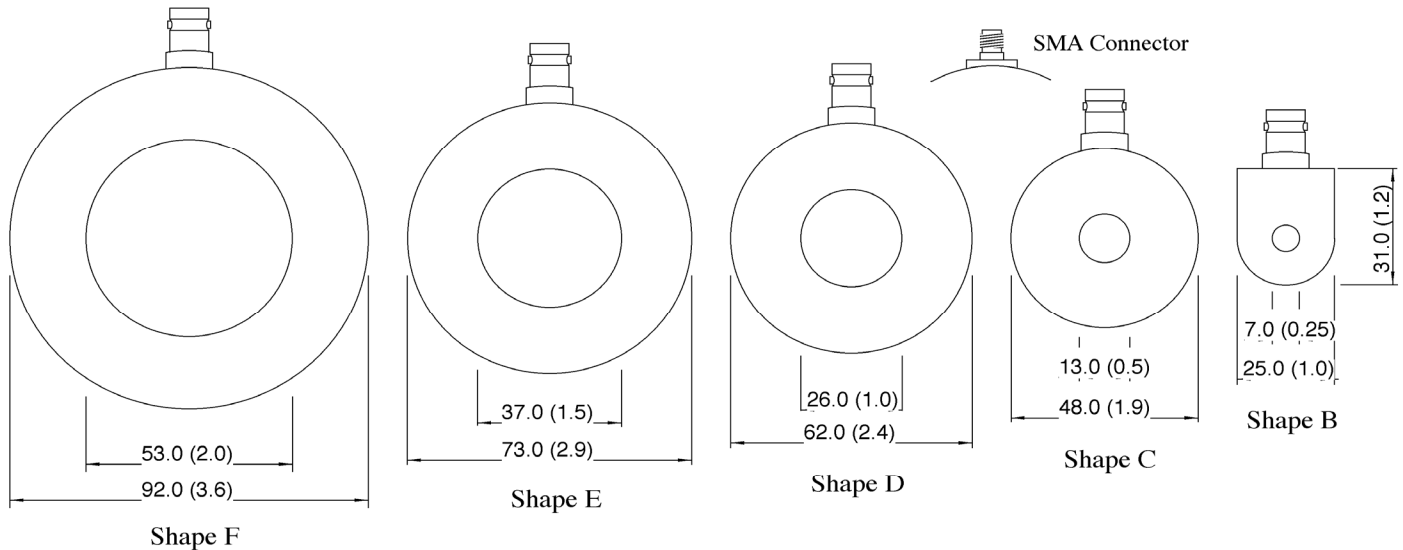
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Dimensions



Connector height BNC : 16mm (0.63") all models. Connector height SMA : 10mm (0.40") all models
 Unit height : 17mm (0.67"), models C,D,E & F, 15mm (0.60") model B

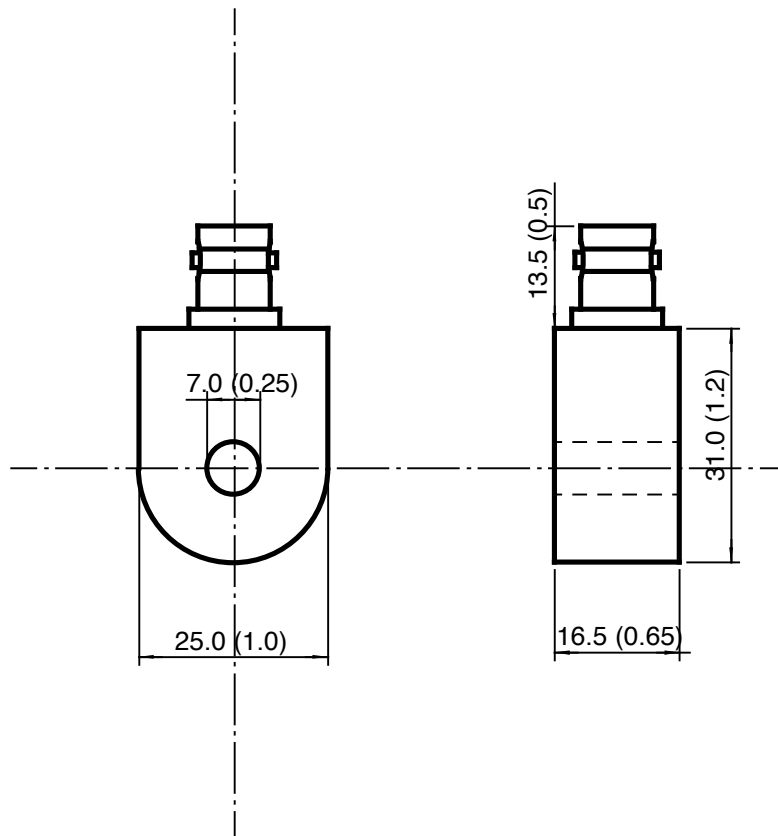
Dimensions in mm (inches)

Model	Output (V/A)		Max rms (A)	Max Peak (A)	Droop (%/us)	Rise (ns)	Max I.t * (As) in 50Ω	-3db low (Hz)	-3db high (MHz)
	in 1MΩ	in 50Ω							
CT-B5.0	5.0	2.5	2	200	3	0.875	0.0001	4800	400
CT-B2.5	2.5	1.25	5	400	0.75	0.7	0.0004	1200	500
CT-B1.0	1.0	0.5	8	1000	0.13	0.7	0.0025	200	500
CT-B0.5	0.5	0.25	11	2000	0.03	1.75	0.01	48	200
CT-B0.25	0.25	0.125	16	4000	0.015	3.5	0.04	24	100
CT-B0.1	0.1	0.05	25	10000	0.006	7	0.25	10	50
CT-B0.05	0.05	0.025	35	20000	0.003	17.5	1	5	20
CT-C5.0	5.0	2.5	2	200	3	0.875	0.0002	4800	400
CT-C2.5	2.5	1.25	5	400	0.75	0.7	0.0008	1200	500
CT-C1.0	1.0	0.5	11	1000	0.13	0.7	0.005	200	500
CT-C0.5	0.5	0.25	16	2000	0.03	1.75	0.02	48	200
CT-C0.25	0.25	0.125	22	4000	0.01	3.5	0.08	12	100
CT-C0.1	0.1	0.05	35	10000	0.004	7	0.5	6	50
CT-C0.05	0.05	0.025	50	20000	0.002	17.5	2	3	20
CT-D5.0	5.0	2.5	2	200	3	0.875	0.0002	4800	400
CT-D2.5	2.5	1.25	5	400	0.75	0.7	0.0008	1200	500
CT-D1.0	1.0	0.5	11	1000	0.13	0.7	0.005	200	500
CT-D0.5	0.5	0.25	16	2000	0.03	1.75	0.02	48	200
CT-D0.25	0.25	0.125	22	4000	0.01	3.5	0.08	12	100
CT-D0.1	0.1	0.05	35	10000	0.002	7	0.5	2	50
CT-D0.05	0.05	0.025	50	20000	0.001	17.5	2	1	20
CT-E5.0	5.0	2.5	2	200	3	0.875	0.0002	4800	400
CT-E2.5	2.5	1.25	5	400	0.75	0.7	0.0008	1200	500
CT-E1.0	1.0	0.5	11	1000	0.13	0.7	0.005	200	500
CT-E0.5	0.5	0.25	22	2000	0.03	1.75	0.02	48	200
CT-E0.25	0.25	0.125	32	4000	0.01	3.5	0.08	12	100
CT-E0.1	0.1	0.05	50	10000	0.002	7	0.5	2	50
CT-E0.05	0.05	0.025	71	20000	0.001	17.5	2	1	20
CT-F5.0	5.0	2.5	2	200	3	0.875	0.0002	4800	400
CT-F2.5	2.5	1.25	5	400	0.75	0.7	0.0008	1200	500
CT-F1.0	1.0	0.5	11	1000	0.13	0.7	0.005	200	500
CT-F0.5	0.5	0.25	22	2000	0.03	1.75	0.02	48	200
CT-F0.25	0.25	0.125	32	4000	0.01	3.5	0.08	12	100
CT-F0.1	0.1	0.05	50	10000	0.002	7	0.5	2	50
CT-F0.05	0.05	0.025	71	20000	0.001	17.5	2	1	20
CT-CALCERT	Certificate of Calibration with amplitude vs. frequency response plots								

* Max I.t product for bipolar pulses in 50Ω termination. When unipolar pulses are measured, CT output winding may require few milliamps of DC-current biasing for maximum I.t product.

Connector Selection

For termination connector append the model number with "-S" for SMA or "-B" for BNC, e.g. CT-C1.0-S

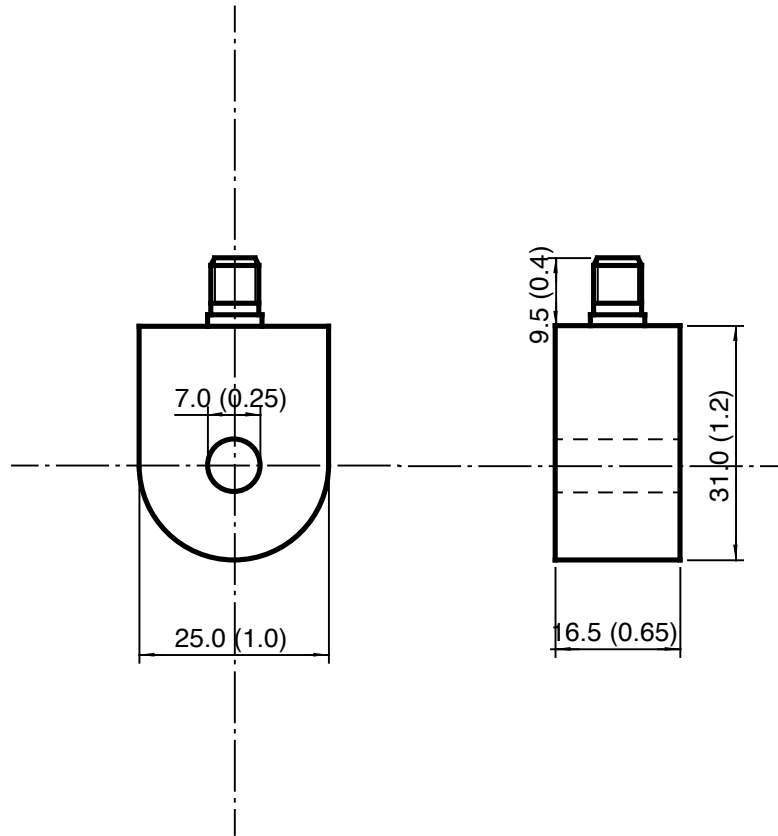


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE B/BNC CONNECTOR



CT-B/XX-B		Date	by	Scale: 1:1
	Created:	October 10, 2005	C. Defrance	
BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

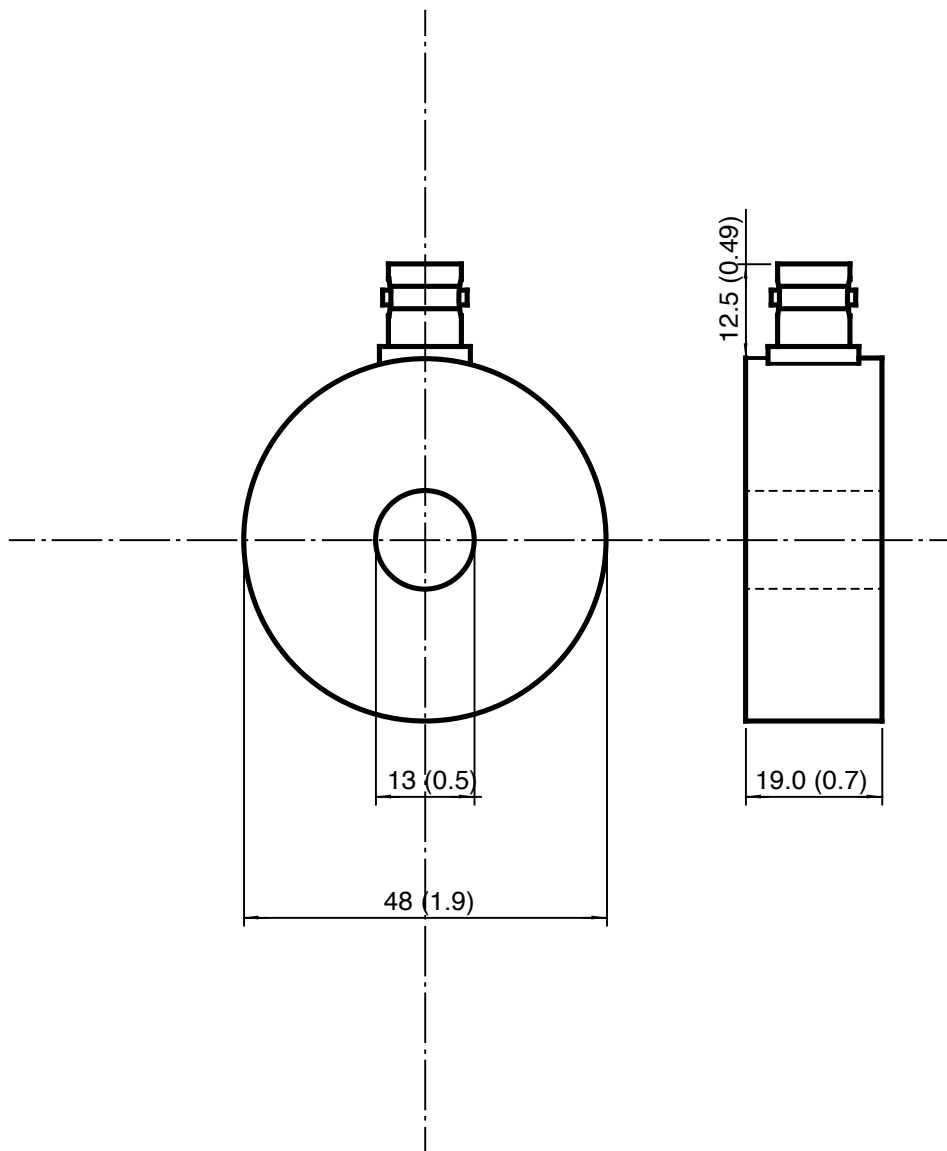


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE B/SMA CONNECTOR



CT-B/XX-S		Date	by	Scale: 1:1
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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

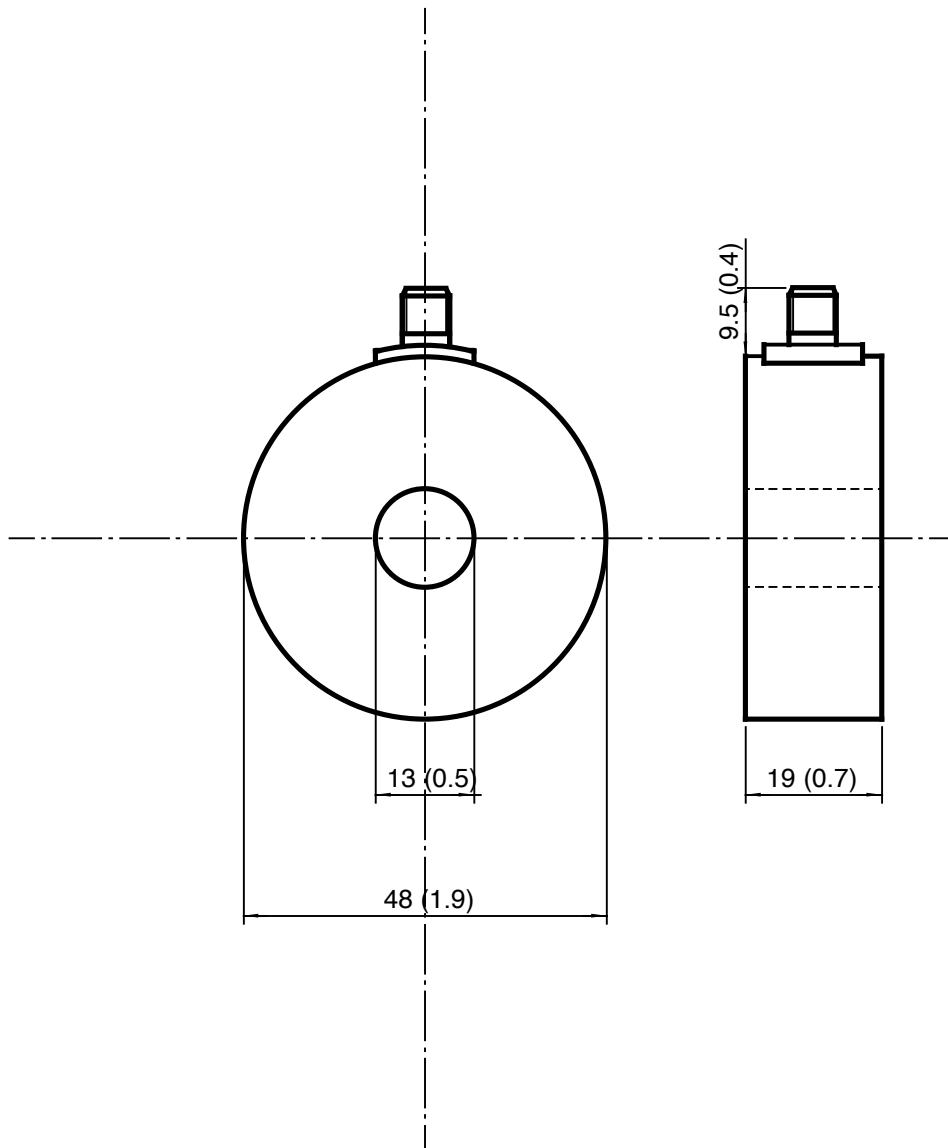


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE C/BNC CONNECTOR



CT-C/XX-B		Date	by	Scale: 1:1
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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

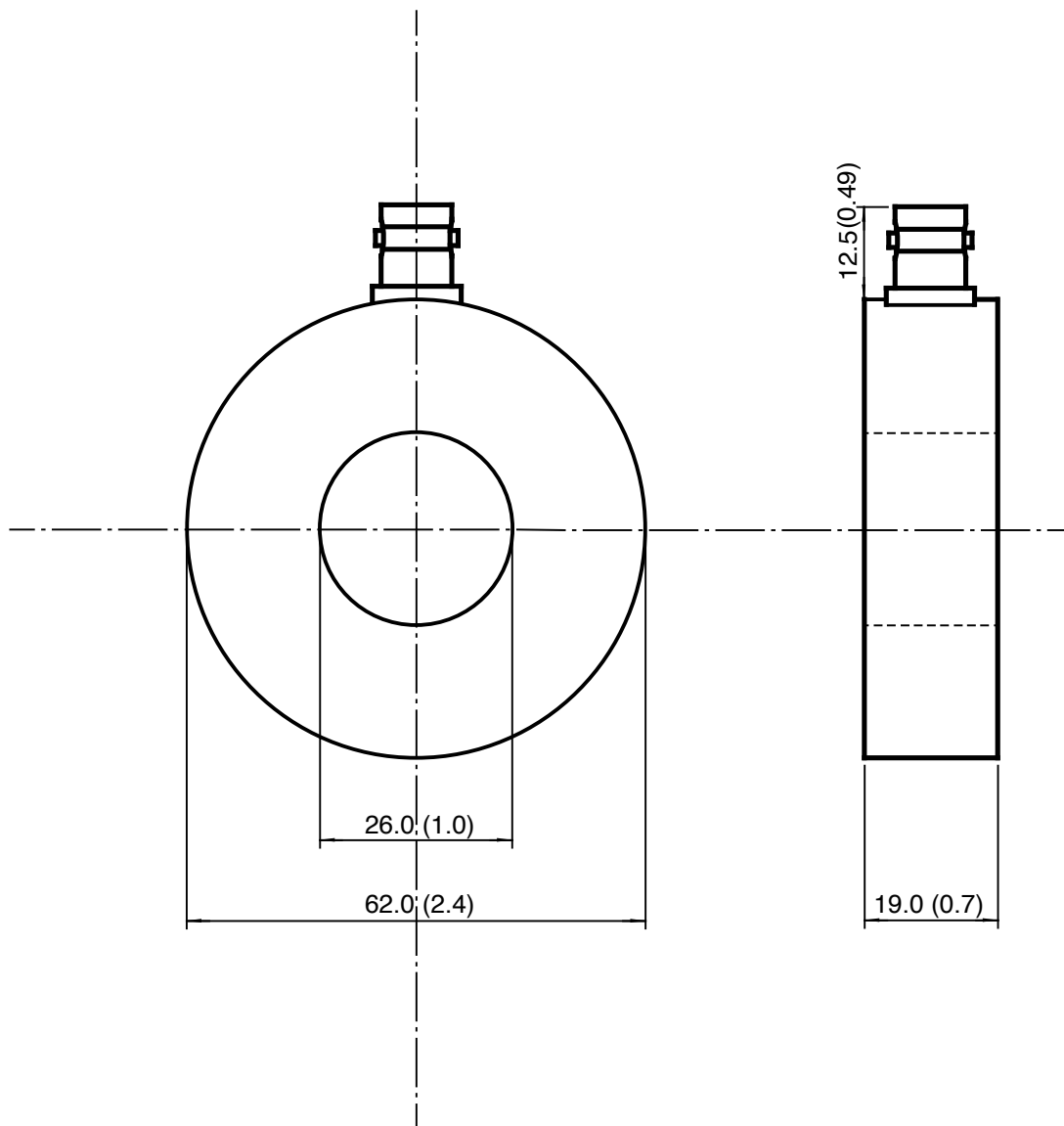


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE C/SMA CONNECTOR



CT-C/XX-S		Date	by	Scale: 1:1
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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

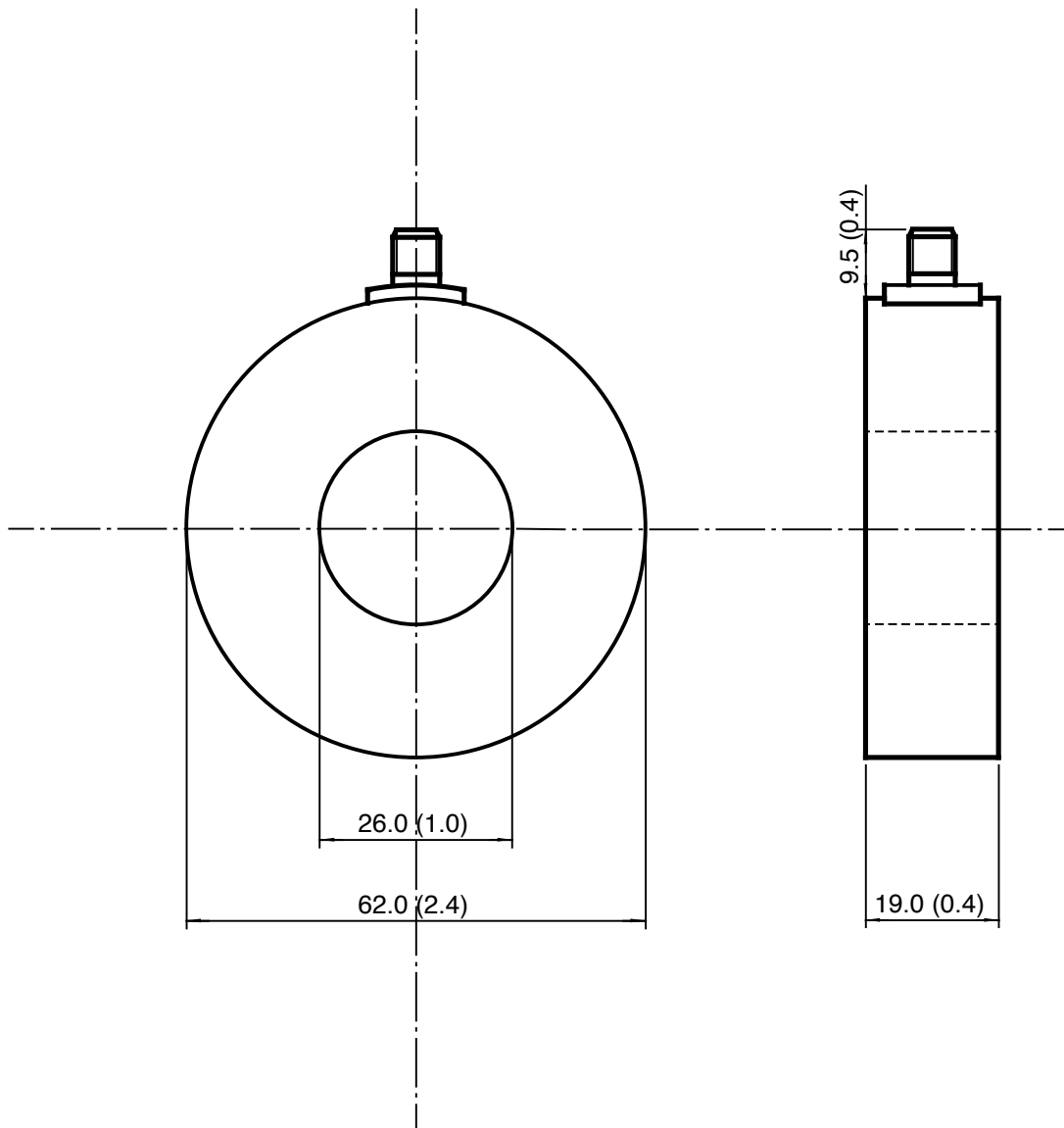


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE D/BNC CONNECTOR



CT-D/XX-B BERGOZ Instrumentation ©1981-2010		Date	by	Scale: 1:1
	Created:	October 10, 2005	C. Defrance	
	Approved:	October 10, 2005	J. Bergoz	Format: A4
Version	1.0			

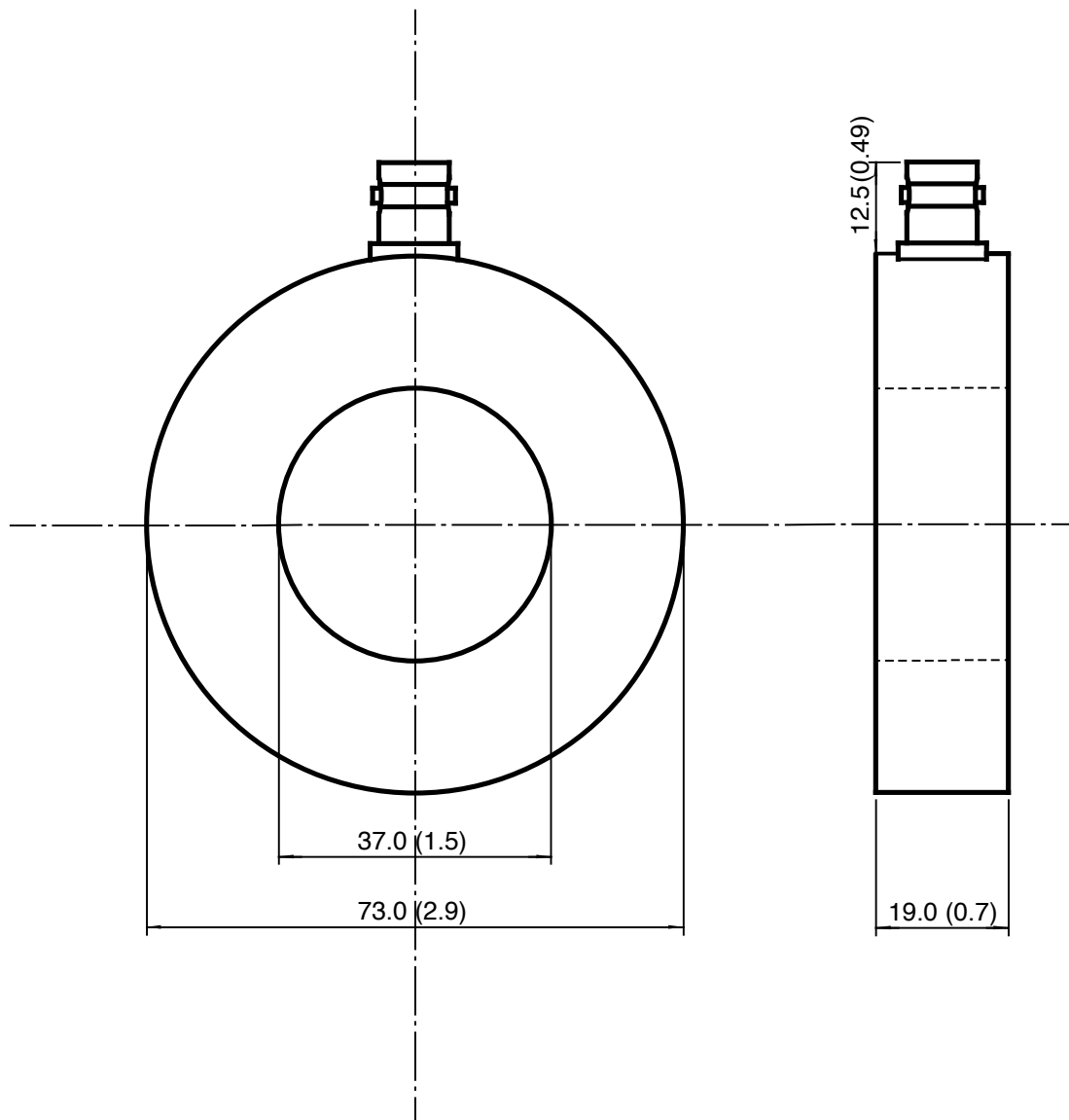


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE D/SMA CONNECTOR



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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
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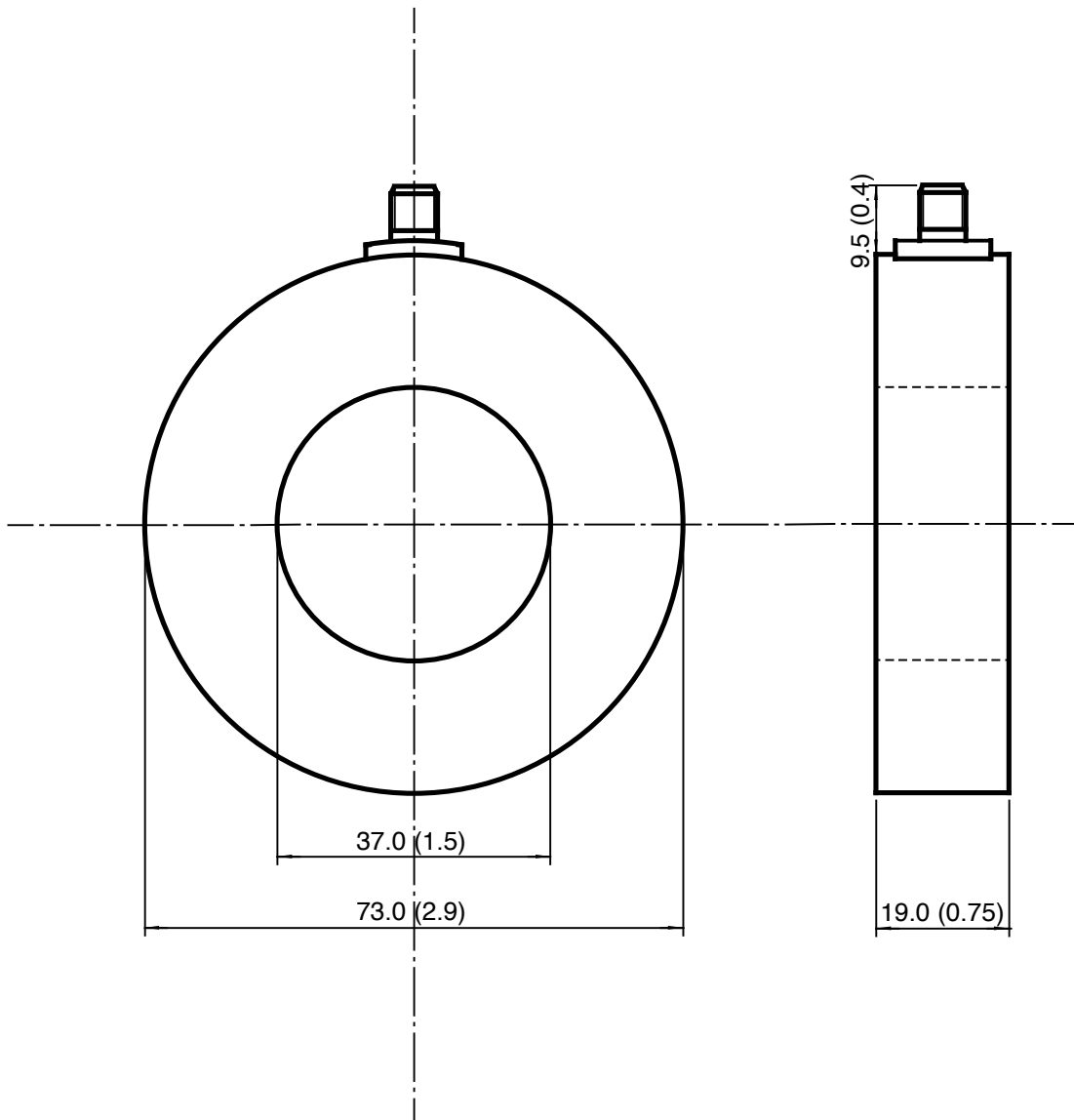


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE E/BNC CONNECTOR



CT-E/XX-B		Date	by	Scale: 1:1
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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

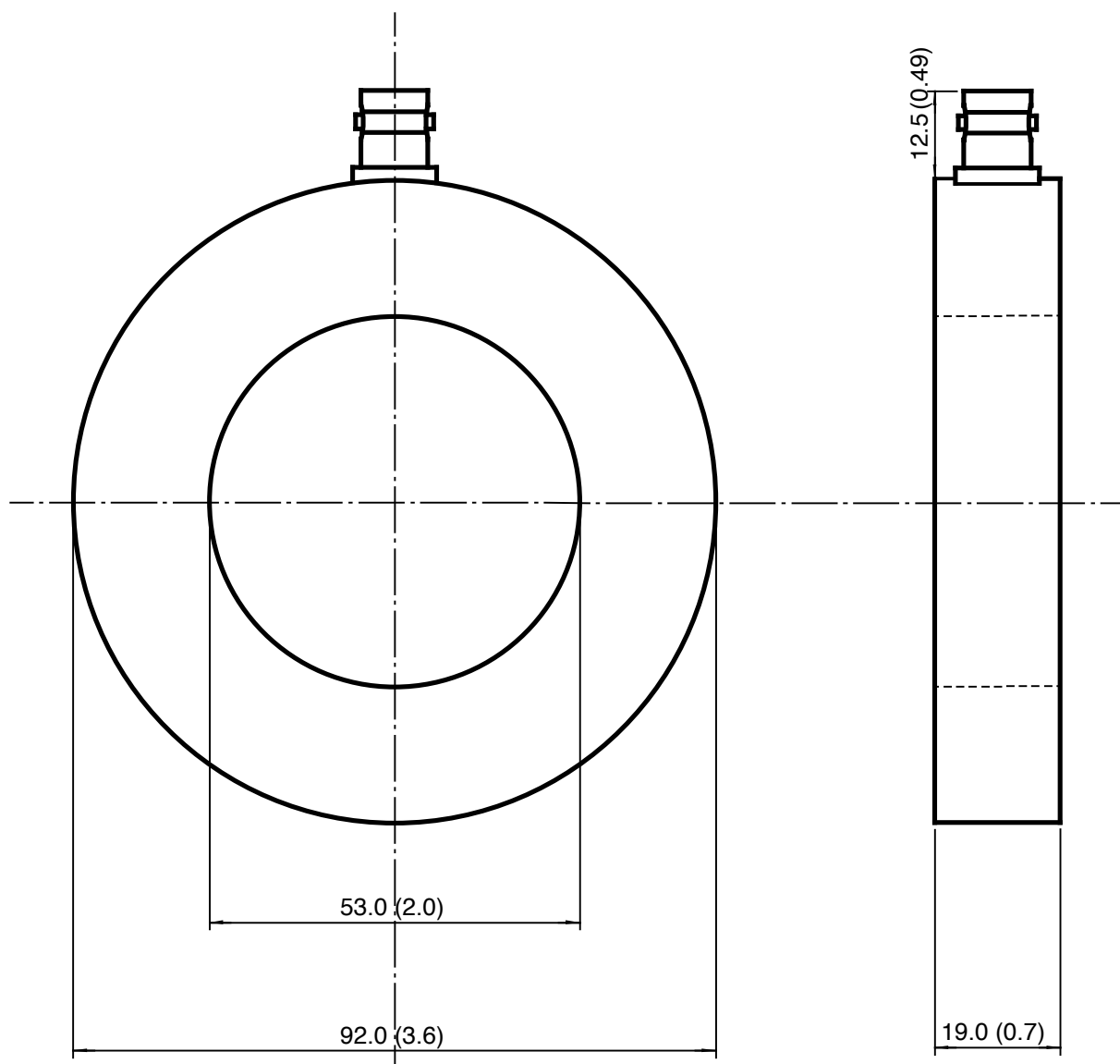


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE E/SMA CONNECTOR



CT-E/XX-S		Date	by	Scale: 1:1
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BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

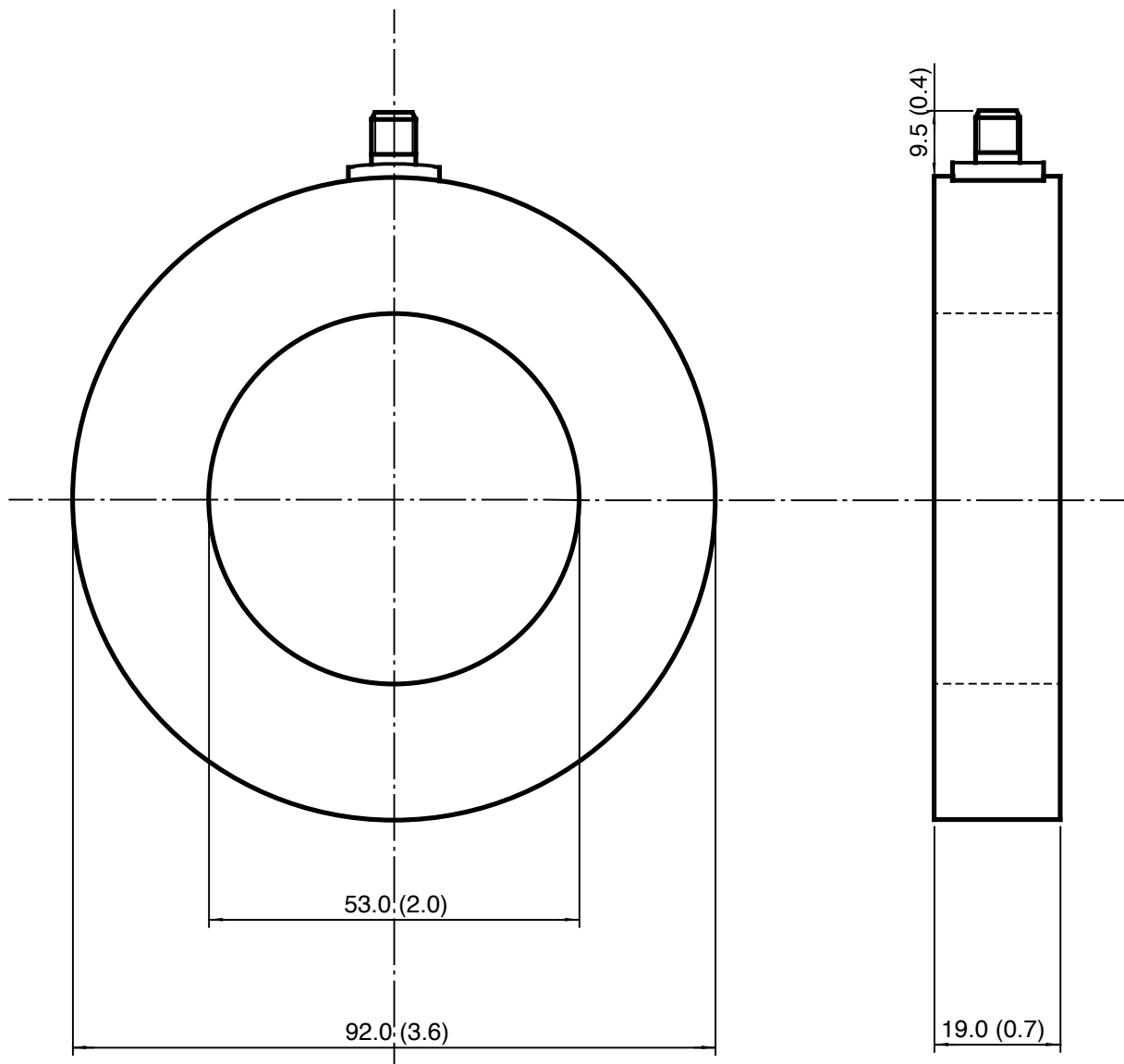


Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE F/BNC CONNECTOR



CT-F/XX-B		Date	by	Scale: 1:1
	Created:	October 10, 2005	C. Defrance	
BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		



Note: All dimensions are given in mm (inches)

CURRENT TRANSFORMER- SHAPE F/SMA CONNECTOR



CT-F/XX-S		Date	by	Scale: 1:1
	Created:	October 10, 2005	C. Defrance	
BERGOZ Instrumentation ©1981-2010	Approved:	October 10, 2005	J. Bergoz	Format: A4
	Version	1.0		

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Instrumentation

TECH NOTE CT-04/10

Current Transformer

Rev. 1.1

Safety

For personnel and equipment safety and measurement accuracy, current measurements on conductors at high voltage should be made only with a conducting shield cylinder placed inside the CT aperture. There should be a low electrical impedance connection from one end only to a reliable local ground. An inner insulating cylinder of adequate voltage isolation should be between the shield cylinder and the conductor at high voltage. Any leakage, induced or breakdown current between the high voltage conductor and the ground shield will substantially pass to local ground rather than through the signal cable to signal ground. Do not create a "current loop" by connecting the shield cylinder to ground from both ends. Current flowing in this loop will also be measured by the CT.

CT output signal termination

The CT output coaxial cable should preferably be terminated in 50 ohms. CT characteristics are guaranteed only when CT is terminated in 50 ohms. The termination should present sufficient power dissipation capability. When CT output is terminated in 50 ohms, its sensitivity is half that when terminated in a high-impedance load.

Installation recommendations

When the current to be measured is at high voltage, capacitive coupling between the high voltage conductor and the CT must be minimized. This becomes a critical issue when a low-sensitivity CT is used. In this context, CTs with less than 0.5 V/A in high-impedance output are considered "low sensitivity".

The CT couples with the primary current conductor in two modes:

- a) Magnetic coupling, which measures the current. This is the only desirable coupling.
- b) Capacitive coupling with the conductor high voltage, which is undesired coupling.

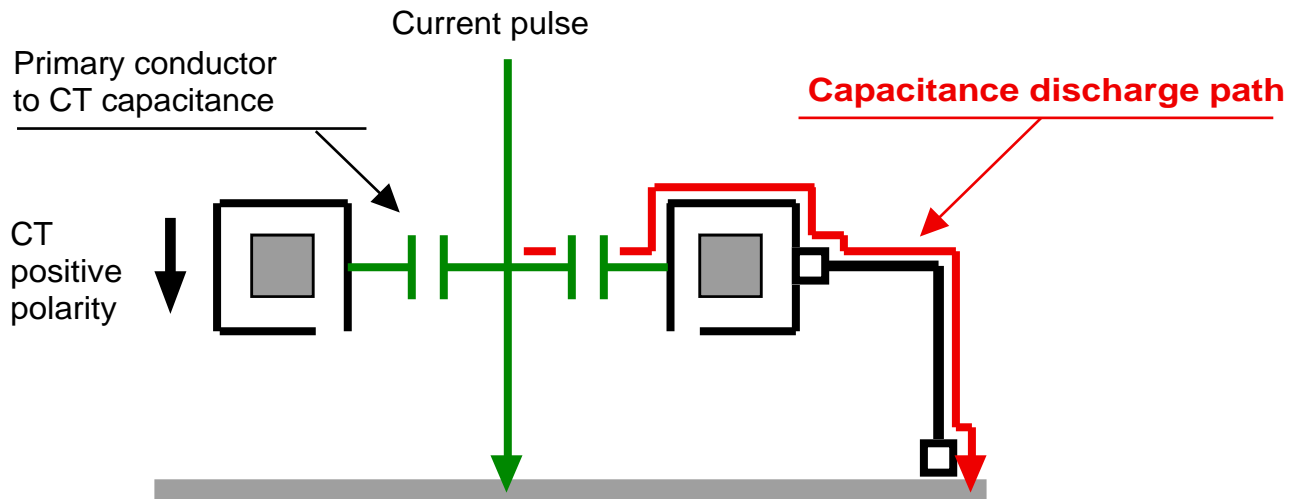
Magnetic coupling and the capacitive coupling can be identified:

The CT output resulting from magnetic coupling changes polarity when the current direction changes. The CT output resulting from capacitive coupling does not change when the current direction changes. Therefore, to identify the signal caused by unwanted capacitive coupling, compare the CT output when the current conductor passes thru CT in one direction, then in the other direction: The output signal is the sum from magnetic coupling and capacitive coupling: the signal from magnetic coupling has changed polarity, while the signal from capacitive coupling has not changed polarity.

To minimize unwanted capacitive coupling:

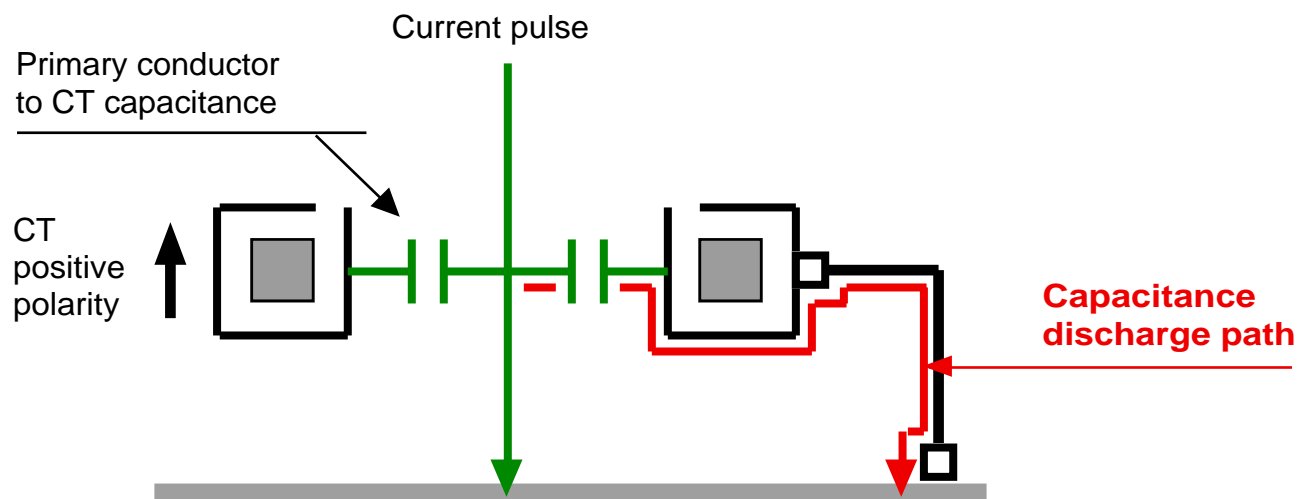
- a) Install common-mode filters on the CT output cable. To realize simply a common-mode filter, use a ferrite (or better: nanocrystalline) core and pass the coaxial cable 6 to 8 times thru the core. It will constitute an excellent common-mode filter.
- b) Install a cylindrical shield between the current carrying conductor and the CT. The shield must be grounded with a low-impedance grounding wire. The shield must be grounded on one side only. If it were grounded on two sides, it would constitute a one-turn short around the CT (to be avoided!)
- c) When possible, maximize the "good" signal from magnetic coupling, by using the most sensitive possible CT. To determine the most sensitive model which can be used, take into consideration:
 - The CT $I \times t$ product must be higher than the primary pulse charge.
 - Higher sensitivity CTs also have higher droop. The CT output signal droop must be acceptable in consideration of the duration of the signal to observe. CT output does not droop when the current is nil, in-between pulses.
 - Short pulses (<50ns) peak current can be up to 4 times the CT maximum current. SMA and BNC connectors can withstand repetitive 3000 volts peak for short time. If the CT output signal is too high, attenuators can be used.

CT inside the capacitive coupling discharge path



The parasitic capacitance between the primary conductor and the CT shell gets charged
The CT core, being *inside* the current loop, measures the parasitic capacitive discharge

CT outside the capacitive coupling discharge path



The parasitic capacitance between the primary conductor and the CT shell gets charged
The CT core, being *outside* the current loop, ignores the parasitic capacitive discharge

JB/revised 15.12.2004

March 12, 2007



Instrumentation

Manufacturer

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Bergoz CT performance report

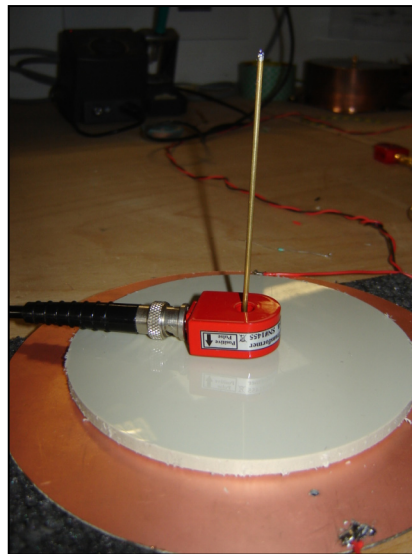
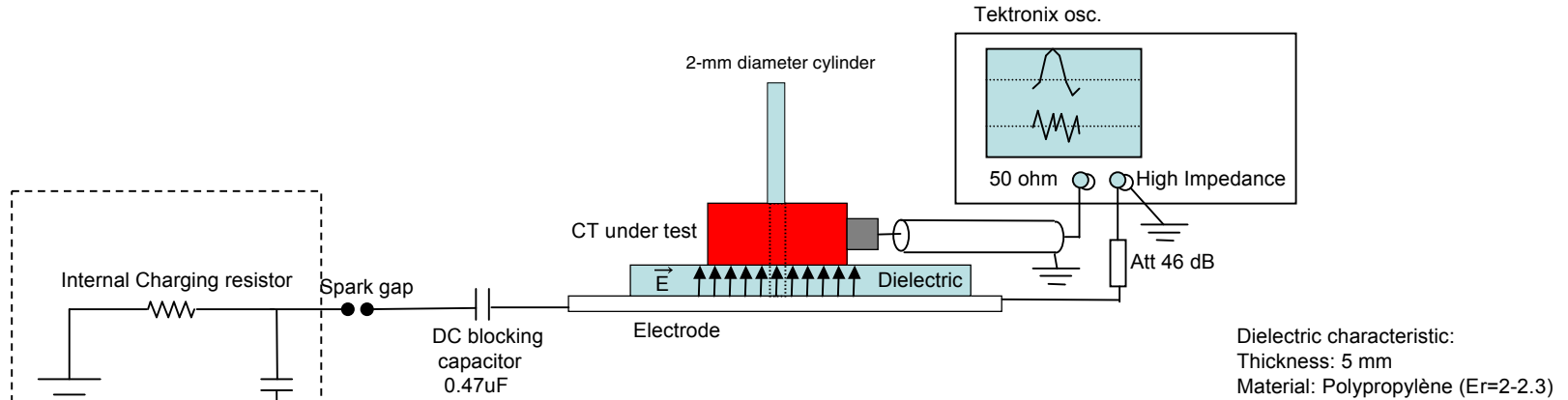
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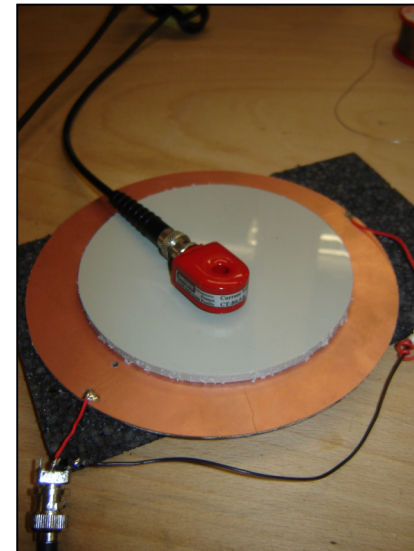
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By Christophe Defrance

Test bench

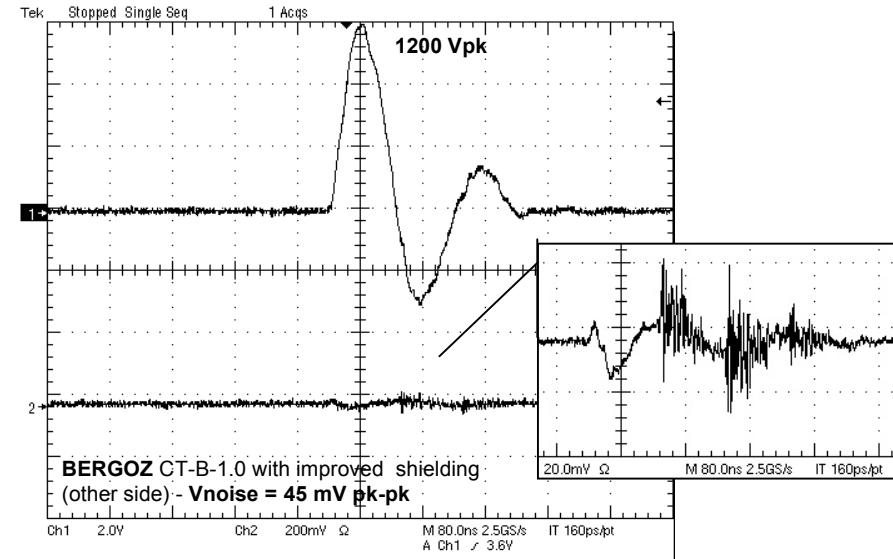
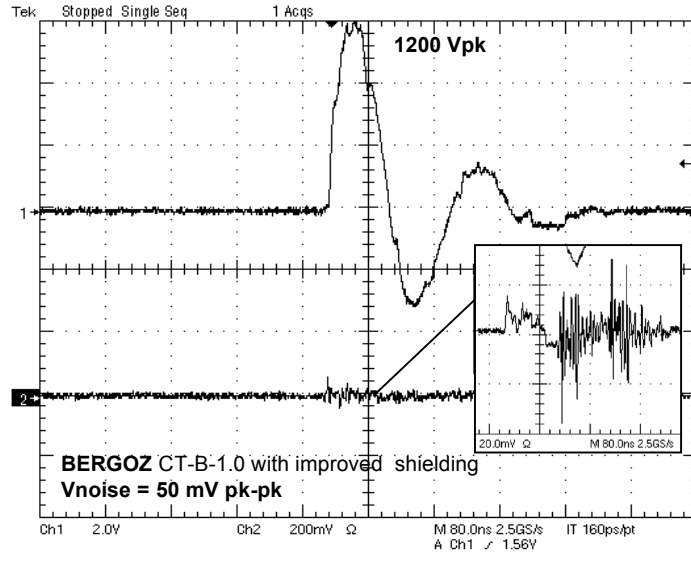


Flat electrode with cylinder through the CT

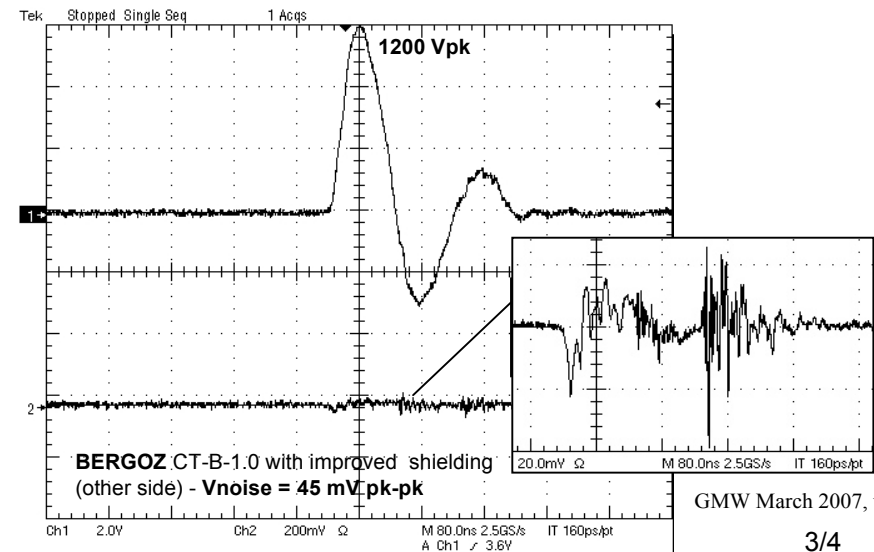
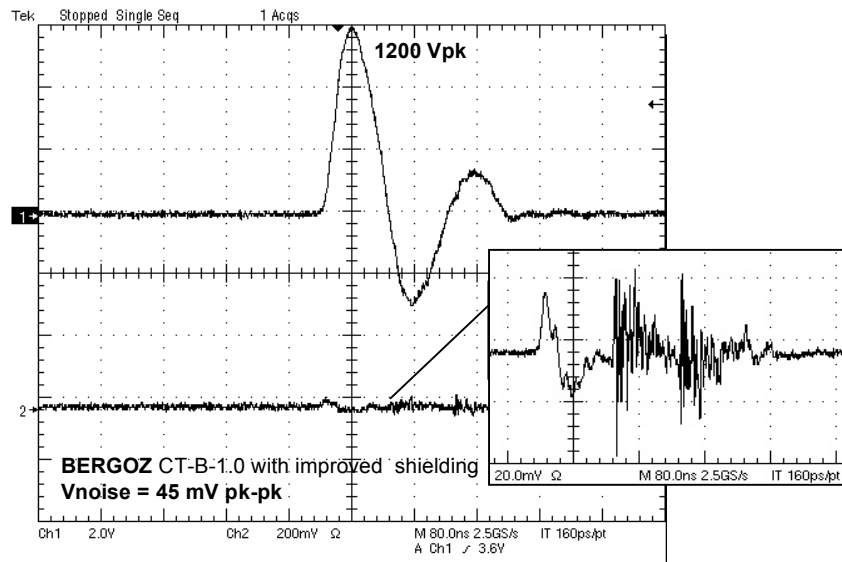


Flat electrode only

Measurements with flat electrode:



Measurements with flat electrode extended with a 2-mm diameter cylinder through the CT:



Bergoz CT amplitude & phase vs. frequency



Instrumentation

