Magnelab, Inc.
600 Weaver Park Rd
Longmont, CO 80501
(303)772-9100
www.magnelab.com

Magnelab HFCT Operational and Installation Guide

Safety and Accuracy Considerations for High Voltage Conductors
Magnelab High Frequency Current Transformers (HFCT) are not designed to function as high voltage isolation transformers. For this reason, precaution must be taken when they are used with high voltage conductors. To insure the safety of personnel and equipment and measurement accuracy, the following additional steps are suggested.

1. A layer of insulation providing adequate voltage isolation should be covering the high voltage conductor where it comes in contact with the CT.
2. A cylindrical conducting ground shield should be placed over the insulation layer. Make sure that the CT aperture is able to fit easily over the ground shield.
3. Connect a low electrical impedance connection from one end of the ground shield to a reliable local ground. Any leakage, induced or breakdown current, between the high voltage conductor and the ground shield can now pass to a local ground rather than through the signal cable to signal ground. Do not connect both ends of the shield to a local ground as this would create a "current loop." Current flowing in a loop created this way would also be measured by the CT and therefore affect your measurements.

HFCT Output Signal Termination
It is recommended that the HFCT output coaxial cable be terminated in 50 Ω. HFCT characteristics are guaranteed only when the CT is terminated in 50 Ω. The termination, whether it is an external load or an internal instrument load, must have sufficient power dissipation capability. Because the internal impedance of the HFCT is 50 Ω, when the HFCT output is terminated in 50 Ω, its sensitivity is half that when terminated in a high-impedance load.

General Installation Recommendations and Troubleshooting
The primary current should be centered in the HFCT aperture. This will minimize positional inaccuracies and prevent errors in current measurement.

The HFCT 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 between the HFCT case and the conductor high voltage, which is undesired coupling. This can become a critical issue with a low-sensitivity CT. Typically, CTs with less than 0.5 V/A connected to a high-impedance load are considered "low sensitivity".

Magnetic coupling and capacitive coupling can be identified by a simple measurement method:

a. The CT output resulting from magnetic coupling changes polarity when the current direction changes.
b. The CT output resulting from capacitive coupling does not change polarity when the current direction changes.

Therefore, to identify unwanted capacitive coupling, compare the CT output with the current conductor passing through CT in each direction. Once identified and isolated, it is possible to determine if capacitive coupling is having a significant impact on your measurements.

To minimize unwanted capacitive coupling:

a. Install common-mode filters on the HFCT coaxial output cable. One simple way to create a common-mode filter is to use a high permeability ferrite or nanocrystalline core and pass the coaxial cable 6 to 8 times through the core. There are also easily available split-core ferrite chokes which clamp or snap on to the cable. Position the choke close to the HFCT if possible.
b. Install a cylindrical shield between the current carrying conductor and the HFCT. For details refer to the first section of this document, **Safety and Accuracy Considerations for High Voltage Conductors.**
c. Minimize the unwanted capacitive coupling by using the most sensitive HFCT that will fit your application. To help determine the appropriate sensitivity which can be used, consider the following:
    1. The HFCT Ixt product must be higher than the primary pulse charge.
    2. Higher sensitivity HFCTs also have higher CT output signal droop. The droop must be acceptable in consideration of the duration of the signal to observe.

Connector and Cable Limitations
The BNC and SMA connectors used in construction of the HFCT units are nominally rated for 500 V. Most standard BNC and SMA cables have similar ratings. Please be aware of this when designing your application and take this into consideration when choosing the HFCT ratio.

As stated above, a 50 Ω termination will be required to achieve peak current values listed in the product specifications.