The substation hardened GIC-4 sensor is offered in fixed, split, and dual sensing cabinet packaging specifically designed for the measurement of Geomagnetic Induced Currents (GIC) in the transformer neutral ground connection. Split core models allow for rapid installation in energized applications.

Transformers at risk from GIC include:
- High voltage
- Grounded wye
- Autotransformers
- Y - Y
- Transformers interconnected with long transmission lines

GIC Sensors provide a means to sense, measure and communicate DC ground currents in harsh utility environments.

**Features & Benefits**

**Ease of Installation**
Fixed core sensors are ideal for new installations.

A large inner diameter (10.16 cm / 4 in. I.D.) conductor opening allows installation onto bus bars or round conductors.

The split core sensors allow the sensor to be installed on both new or existing transformer neutral ground connections without modification or the need to disconnect the ground. In most applications, the sensor can be installed while the transformer is energized.

A dual sensing cabinet model features a stainless steel enclosure and two installed sensors, allowing for rapid field installation.

Each sensor includes a type C conduit body and 1/2" NPT fitting for access to the conduit system for inspection, wire pulling and maintenance.

Sensors are constructed of a UV-resistant material for direct installation around a conductor without the need for a separate enclosure.

**Ranges of Sensing**
GIC Sensors are offered in three sensing ranges.

<table>
<thead>
<tr>
<th>Model</th>
<th>Range (Nominal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>+/- 45 Amps DC</td>
</tr>
<tr>
<td>H</td>
<td>+/- 360 Amps DC</td>
</tr>
<tr>
<td>S</td>
<td>+/- 500 Amps DC</td>
</tr>
</tbody>
</table>

Model L is designed for optimal resolution of small geomagnetic disturbances. Model H is designed for measurement of large coronal mass ejections, and Model S provides the industry’s largest range of GIC sensing to include once in a hundred year events.

**DC and Near DC Signals Only**
The system has a built-in 4th order, low pass filter tuned to 3Hz. This ensures the output provides the desired signal with no interference from higher frequencies.

**Noise Immunity**
The sensor output is designed to provide maximum accuracy despite the high magnetic field environments that exist in the substation environment.

**Temperature Stability**
The selected sensor core ensures measurement accuracy of +/- 2% across the wide range of temperatures commonly found in a substation.
Applications

- Copper Bus
- Bare Cable
- Insulated Conductors

Designed to Detect GIC

The GIC-4 sensor is designed to outperform general purpose Hall Effect current transformers because it is specifically designed to measure a range of induced DC ground currents. Primary design differences are:

- Exclusive detection of DC & Near DC Signals: By properly monitoring geomagnetic induced currents GIC-4 includes both DC and near DC currents. Higher frequency currents (typically detected by standard Hall Effect current transducers) are filtered out.
- The GIC-4 sensor has a built-in filter tuned to 3Hz to block the higher frequency signals.
- The 4th order low pass filter, ensures the power frequency is effectively blocked, providing the desired output signal.

Single or Dual Range Sensing

Three models offer nominal sensing ranges of +/- 45A DC, +/- 360A DC, and +/- 500A DC.

Installing two sensors side-by-side with differing ranges provides the maximum precision and accuracy coverage of the majority of solar, coronal mass ejections (CME) where the lower range provides better resolution of smaller events and the higher range provides measurement for those once-in-a-hundred solar events.

Accuracy is Temperature Stable

The core material selected for the sensor provides a consistently accurate reading across a wide range of operating temperatures.

The sensor measurement accuracy is proven to be:

- +/- 1% accuracy: (0° C to 50° C / 32° F to 122° F)
- +/- 2% accuracy: (-40° C to 85° C / -40° F to 185° F)

Typical Characteristics vs. Temperature
Exceptional Linearity
The linearity of the GIC sensor output is exceptional. The GIC amplitude response graph illustrates sensor quality, linearity and consistency throughout the sensing range and over current and expanding production lots.

Noise Resistant Output
The sensors 4-20mA output provides several advantages:

• Inherent voltage and four milliamperes of current are available to power the sensor and transmitter circuit. Sensor power and signal travel on one pair of wires.

• The current loop signal provides added noise immunity. The instrumentation will terminate the current loop utilizing a low ohm value resistor. Therefore, capacitive coupled noise does not have a significant effect on the desired output signal.

• The 4-20mA signal is unaffected by voltage drops, introduced by long connection wiring and associated terminations.

• There is positive indication of connection or sensor problems because instruments recognize a zero (0 mA) signal as an out of range value and will alert you of a problem.

• The signal is isolated. Differences in ground potential at the two ends of the loop do not affect the signal.

• The output is compatible with a wide number of instruments (4-20mA is a standard input for most instruments).

Building on Years of Experience
Dynamic Ratings installed the first Geomagnetic Induced Current (GIC) sensors in 2007. The first installations utilized a commercially available Hall Effect transducer. The sensor was installed in a separate enclosure and the transformer ground was modified to route through the enclosure.

In 2011 the number of customers interested in monitoring GIC expanded. Dynamic Ratings recognized the need to improve upon the basic, commercially available Hall Effect transducers available and invested in evaluating alternatives.

A substation hardened design concept was refined through rounds of product development innovation, resulting in fourth generation GIC sensors.

The GIC-4 sensor has proven to provide a dramatic improvement in performance and ease of installation.
**SPECIFICATIONS**

**Geomagnetic Induced Current (GIC) Sensors**

**Part #** | **Sensing Range (Nominal)** | **Packaging** | **Description**
--- | --- | --- | ---
GIC-4-F-L | -45 to 45 Amps DC | Fixed Core | One GIC Sensor with a 4th order low pass filter, including a type C conduit body with 1/2" NPT type fitting.
GIC-4-F-H | -360 to 360 Amps DC | Fixed Core | One GIC Sensor with a 4th order low pass filter, including a type C conduit body with 1/2" NPT type fitting. This model includes factory installed core gap range adjustors.
GIC-4-S-L | -45 to 45 Amps DC | Split Core | One GIC Sensor with a 4th order low pass filter, including a type C conduit body with 1/2" NPT type fitting.
GIC-4-S-H | -360 to 360 Amps DC | Split Core | Two GIC Sensors. Sensing range by part number is shown on the left. Each sensor has a 4th order low pass filter. Both sensors are packaged in a 51 cm x 51 cm x 25 cm / 20 in. x 20 in. x 10 in. Stainless Steel enclosure.
GIC-4-S-5 | -500 to 500 Amps DC | Split Core | Two GIC Sensors. Sensing range by part number is shown on the left. Each sensor has a 4th order low pass filter. Both sensors are packaged in a 51 cm x 51 cm x 25 cm / 20 in. x 20 in. x 10 in. Stainless Steel enclosure.

**Dual (GIC) Sensing Cabinets**

**Part #** | **Sensing Range (Nominal)** | **Description**
--- | --- | ---
GICX2 | -45 to 45 Amps DC and -360 to 360 Amps DC | One GIC Sensor with a 4th order low pass filter, including a type C conduit body with 1/2" NPT type fitting.

**Contact your sales representative for application assistance or pricing.**