SIDEWINDER AC CURRENT SENSOR

Rogowski Coil Fundamentals

- Sidewinder Current Sensor is based on the Rogowski Coil Principle discovered by W. Rogowski in 1912.
- When an AC current flows through the center of the sensor, an output voltage is induced, that is proportional to the rate of change of the current, $\frac{di(t)}{dt}$.

$$v(t)_{out} = -M \frac{di(t)}{dt}$$

where $M = \mu_o s n$

$\mu_o$ = permeability of air = $4\pi \times 10^{-7}$ H/m

$s$ = cross sectional area of a turn (m$^2$)

$n$ = number of turns per unit length (m)

Current Sensing Focus on Metering

- AC current sensor, for 50/60Hz, 120/240V Single Phase applications
- Designed to provide a highly linear output voltage over a very wide dynamic range of 3000:1
- Meets the Class 0.2 percent accuracy limits for currents from 0.1 A to 200A and above for IEC 60044 and ANSI C 12.20
- Patent Pending design provides immunity to external magnetic fields
  - IEC 62053-21 and 62053-22, Table 6, Class 0.5
  - Per ANSI C 12.1 and C 12.20, Test 18
- Additional Faraday shield provides immunity to external voltage fields
- Coreless design provides lower cost than a CT
- Very high bandwidth AC Sensor from 1 Hz up to 1MHz and higher
- Suitable for Arc Fault Sensing in high current applications
### Table 1 Sidewinder AC Current Sensor Technology Comparison

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Shunt</th>
<th>Current Xfmr</th>
<th>Hall Effect</th>
<th>Rogowski Coil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Amplitude &amp; Phase</td>
<td>++</td>
<td>0</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Wide Range - 5 decades</td>
<td>0</td>
<td>0</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>High Saturation Current</td>
<td>-</td>
<td>--</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Wide Bandwidth</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>DC Immunity</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Temperature Independent</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Low Power Consumption</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Low Cost</td>
<td>++</td>
<td>0</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Tamper Resistant</td>
<td>+</td>
<td>-</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Light Weight</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flexible Size &amp; Shape</td>
<td>0</td>
<td>-</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

### Pulse Current Sensor

Low Frequency Equivalent Circuit

\[
V_{sa} = K_i I_{pa} \quad f_r << f_{SRF}
\]

\[
V_{out} = \frac{V_{sa}}{R_S} + L_S I_{pa}
\]
- Black wire is connected to the Current Plus pin I+
- Connect the White wire and the Green wire together, and then connect them to the Current Negative pin, I-
- No burden resistor is required
- Requires an IC that supports Rogowski Coils

**Vendor** | **IC Families**
---|---
Accent | AMS201, AMS231
Analog Devices | ADE7753, ADE7878
Atmel | ATM90Exx
Cirrus Logic | CS5484, CS5490
IDT | 90E32, 90E36

**Vendor** | **IC Families**
---|---
Maxim Integrated | 71M6531, 71M6533
Renesas | RX21A
ST Micro | STPM01
Texas Instruments | MSP430FE