MORE ABOUT INTEGRATORS.

Rocoil®
PRECISION ROGOWSKI COILS

Since the output from the coil is proportional to the rate of change of current, an integrator is essential to give the correct current waveform.

Active Integrators:

Active integrators are generally much more versatile than passive integrators. Most of our integrator types are active. They can be used for low currents (less than an amp) and low frequencies (less than 1Hz) as well as for currents of more than 1 million amps and frequencies approaching 1MHz. The low-frequency performance of a coil + integrator combination is determined by the integrator design.

Passive Integrators:

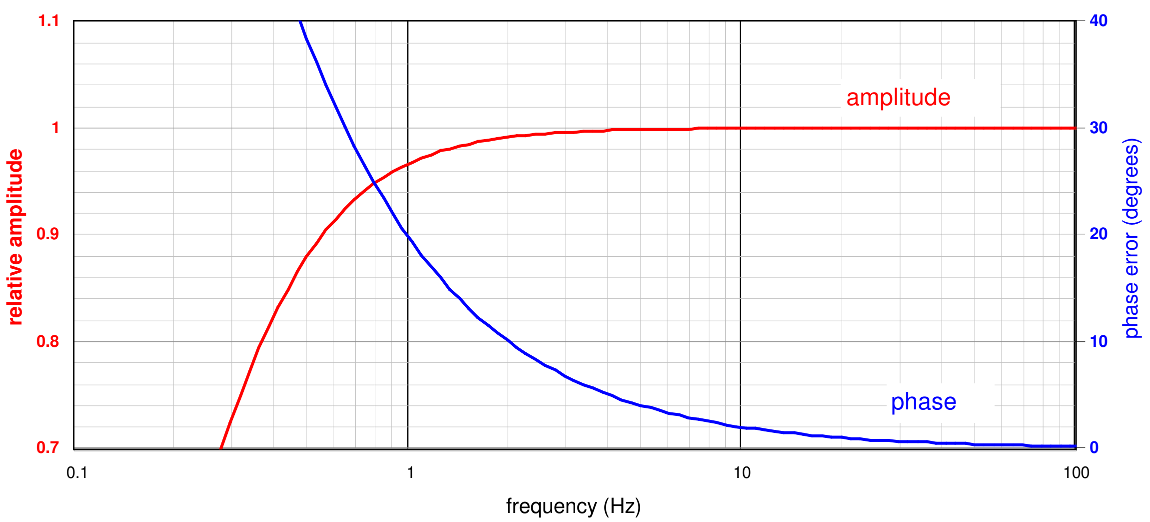
A passive integrator is basically a resistor/capacitor network. Passive integrators are only really suitable for large, fast current pulses (big dI/dt) because they need a high voltage from the coil to give acceptable accuracy. Their low-frequency capability is limited. For example they have been used with lightning test equipment. They have the advantage of not needing a power supply.

Integrator Time Constant:

An integrator is characterised by its time constant (RC) where R is the integrating resistor and C is the integrating capacitor. By using different values of R and C the characteristics of the complete transducer (coil + integrator) can be varied over an enormous range. For example a typical flexible coil can be used to make current measurements from a few mA to more than a million amps simply by changing these two components in the integrator.

Bandwidth:

As a general rule, for a measuring system consisting of a coil and an integrator, the low-frequency behaviour is determined by the design of the integrator and the high-frequency performance depends on the properties of the coil. The picture shows a typical low-frequency amplitude and phase response. In the example shown the effective droop is -0.22%/msec.



For any particular design the amplitude and phase response can be predicted reliably and used to make corrections to the measurements. Where necessary the Low Frequency response can be 'tailored' to suit specific requirements, for example to give a very low phase error. More information about the low-frequency response is given in 'Dealing with Droop.pdf'. (See website *Theory > Articles and Papers*)

Measuring 'Direct Current':

Unfortunately it is NOT possible to measure continuous direct currents with a Rogowski coil but the question is frequently asked and different people mean different things by 'DC'. This is what you can do:

(1) Measure the DC offsets on AC transients.
(2) Measure uni-directional current pulses as well as oscillatory pulses.
(3) Measure the AC part of waveforms that contain a DC component such as a full-wave rectified current or a transformer inrush current.
(4) Measure the ripple superimposed on a DC current.
(5) Measure very low frequencies (less than 1Hz).

It is also possible to measure a direct current by measuring the AC currents feeding the rectification system that supplies the DC. This can be quite an accurate method. We have provided a system that uses this principle to measure alternator rotor currents. The technique has also been used for monitoring currents in an aluminium electrolysis plant.