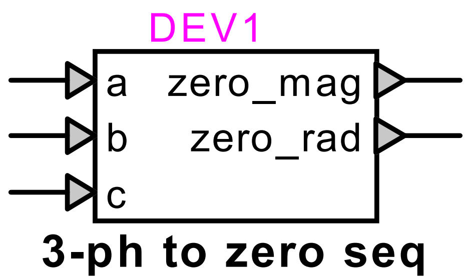
Meter : 3-phase to zero sequence polar



1 Description

This device converts the first harmonic of the instantaneous value of 3 phase signals to the polar coordinates of the corresponding zero-sequence phasor in a reference frame rotating at the fundamental frequency.

1.1 Pins

This meter has five pins:

pin	*type*	*description*	*units*
a	input pin	phase-a input signal	any
b	input pin	phase-b input signal	same as a
c	input pin	phase-c input signal	same as a
mag	output pin	magnitude of zero-sequence phasor	same as a
rad	output pin	angle of zero-sequence phasor	rad

1.2 Parameters

The following parameter must be defined:

parameter	*description*	*units*
freq	fundamental frequency of the input signal	Hz

1.3 Input

The input pins may be connected to any control signals.
The 3 signals are the instantaneous values of a 3-phase quantity.

1.4 Output

The output is the polar phasor representation of the zero-sequence transformation of the instantaneous values of the 3-phase input signals. The polar coordinates are the magnitude and angle of that phasor in a reference frame rotating at the fundamental frequency.

The coordinates of the phasor in that reference frame are calculated over a sliding time window of period equal to *1/freq*, as follows.

The (x,y) coordinates of the first harmonic of each input signal *k* are calculated as

$$
\begin{aligned}
x_k &= \frac{2}{period} \cdot \int_{t-period}^{t} in_k(t) \cdot \cos(2\pi \cdot freq \cdot t) \cdot dt \\
y_k &= \frac{2}{period} \cdot \int_{t-period}^{t} -in_k(t) \cdot \sin(2\pi \cdot freq \cdot t) \cdot dt
\end{aligned}
\qquad (1)
$$

where the negative sign for *y* follows the engineering convention for an inductive (lagging) current to have a negative angle when phasor rotation is counterclockwise.

The (x,y) coordinates of the zero-sequence transformation are calculated as

$$
\begin{aligned}
seq0\_x &= \frac{1}{3} \cdot (x_a + x_b + x_c) \\
seq0\_y &= \frac{1}{3} \cdot (y_a + y_b + y_c)
\end{aligned}
\qquad (2)
$$

The conversion to polar coordinates is calculated as

$$
\begin{aligned}
magnitude &= \sqrt{seq0\_x^2 + seq0\_y^2} \\
angle &= \tan^{-1}\left(\frac{seq0\_y}{seq0\_x}\right)
\end{aligned}
\qquad (3)
$$

The phasor magnitude is the peak amplitude, not the RMS value. The phasor angle is expressed in radians.