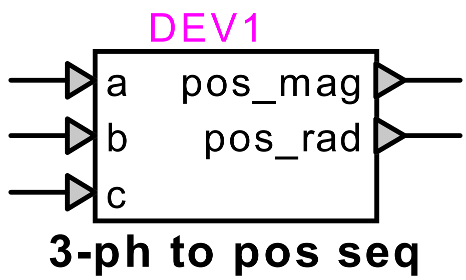
Meter : 3-phase to positive sequence polar



1 Description

This device converts the first harmonic of the instantaneous value of 3 phase signals to the polar coordinates of the corresponding positive-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 pos-sequence phasor	same as a
rad	output pin	angle of pos-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 positive-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

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

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 positive-sequence transformation are calculated as

$$seq1\_x = \frac{1}{3} \cdot \left(x_a + r x_b + r^2 x_c \right)$$
$$seq1\_y = \frac{1}{3} \cdot \left(y_a + r y_b + r^2 y_c \right) \qquad (2)$$

where r represents a phasor rotation of $2\pi/3$, and r^2 a rotation of $4\pi/3$.

The conversion to polar coordinates is calculated as

$$magnitude = \sqrt{seq1\_x^2 + seq1\_y^2}$$
$$angle = \tan^{-1}\left(\frac{seq1\_y}{seq1\_x} \right) \qquad (3)$$

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