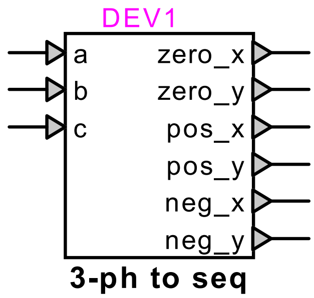
Meter : 3-phase to sequence x,y



1 Description

This device converts the first harmonic of the instantaneous value of 3 phase signals to the (x,y) coordinates of the corresponding zero-, positive-, and negative-sequence phasors in a reference frame rotating at the fundamental frequency.

1.1 Pins

This meter has nine 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
zero_x	output pin	x-coordinate of zero-sequence phasor	same as a
zero_y	output pin	y-coordinate of zero-sequence phasor	same as a
pos_x	output pin	x-coordinate of pos-sequence phasor	same as a
pos_y	output pin	y-coordinate of pos-sequence phasor	same as a
neg_x	output pin	x-coordinate of neg-sequence phasor	same as a
neg_y	output pin	y-coordinate of neg-sequence phasor	same as a

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 outputs are the (x,y) phasor representation of the zero-, positive-, and negative-sequence transformations of the instantaneous values of the 3-phase input signals. The (x,y) coordinates are the *x*-axis and *y*-axis projections of the phasors on a reference frame rotating at the fundamental frequency.

The (x,y) coordinates of the phasors 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

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

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

$$seq0\_x = \frac{1}{3} \cdot (x_a + x_b + x_c)$$
$$seq0\_y = \frac{1}{3} \cdot (y_a + y_b + y_c) \quad (2)$$

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

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

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

$$seq2\_x = \frac{1}{3} \cdot \left(x_a + r^2 x_b + r x_c\right)$$
$$seq2\_y = \frac{1}{3} \cdot \left(y_a + r^2 y_b + r y_c\right) \quad (4)$$

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