

**BASLER**

**BE1-46N**

**Negative Sequence Current  
Protection**

# Testing Methods

# Pick up Tests

## Single Phase Test

- Inject current into one of the phases and ramp up.
- The relay should pick up at  $3(\text{setting} \times \text{tap})$ .
- (Spoiler alert – manufacturers are not agreed on whether the setting should be based on a single phase quantity or a 3 phase quantity.)

# Three Phase Test

- Inject current into all of the phases, reverse sequence, and ramp up.
- The relay should pick up at the setting x tap.

# Two Phase Test

- Inject current into two of the phases,  $180^{\circ}$  apart, and ramp up.
- The relay should pick up at 173% (setting x tap).

# Two Phase Test

- If you have a single phase test set, you can jumper 2 of the phase inputs in series, but be sure the polarity is reversed so the phases are  $180^{\circ}$  apart.
- Again ramp up to 173% (setting x tap).

# Timing Tests

## Alarm

- Test the 3 second alarm delay by injecting negative sequence current above the Alarm pickup setting and time the LED light. You can also monitor terminals 11-12 for the alarm output.

# Timing Tests

## K setting

- It may be helpful to think of the K setting as a time dial.
- It represents an inverse time curve – the more negative sequence current, the faster the relay responds.
- As seen on the graph from the IM, changing the K setting moves the curve up or down the time axis in much the same way as the time dial setting moves an overcurrent curve up or down.



# K Set

## $I_2t$ Heating Characteristic

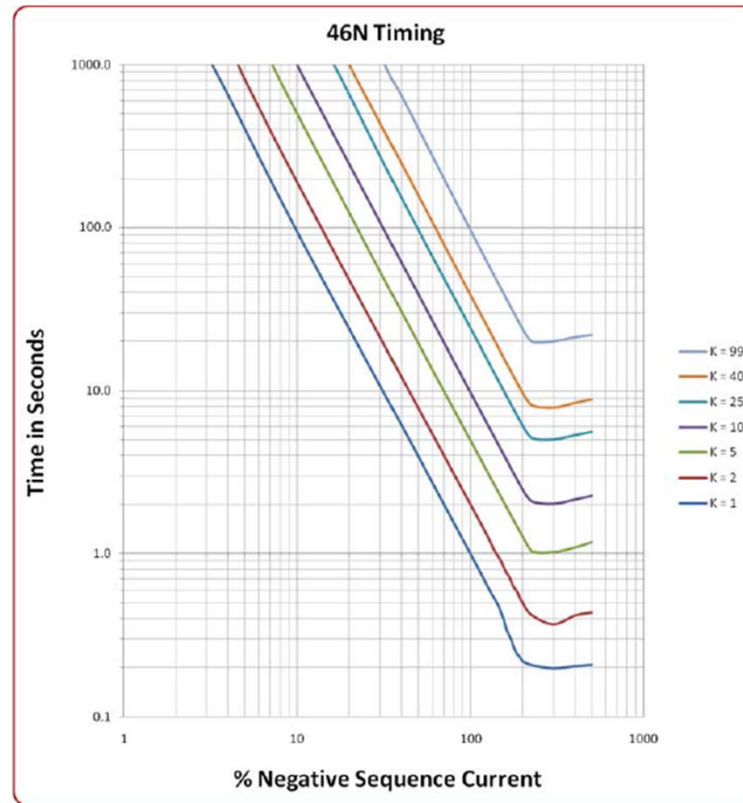


Figure 3-2. Characteristic Curves

# Timing Tests

## K setting

- Test the K setting delay by injecting negative sequence current above the Pickup setting and time the pickup LED light. You can also monitor terminals 1-10 for the trip output. The time is based on this formula from IM 5-3:

$$t = \frac{K}{(I_2 pu)^2}$$

If K = 10 and PU = 0.5 :

$$t = \frac{10}{(0.5)^2} = 40 \text{ seconds}$$

# Test a Setting - 1

This is a setting for a small hydro generator. Set your relay with these settings and test the relay.

G	Name	Setting	Range
0	Control Power	125VDC	
0	Tap	G (4.4)	
0	Pickup	30	
0	Alarm	20	
0	K Set	10	
0	Max Time	10	TIMES X 10

# Test Part 2

- Now change the Tap to 4.5, K set to 2 and test again. Is there a difference between the K set time and the max time (see IM pg 5-3)?
- Play around with the K set and Max time to get a sense of how they interact.