7SG163 Ohmega 300 Series

7SG163 Protection Relay

Document Release History

This document is issue 2010/02. The list of revisions up to and including this issue is:
Pre release

2010/02	Document reformat due to rebrand

Contents

SIEMENS
siemens-russia.com

1 Voltage Protection

The relay provides two independent elements for under-voltage (UV1 & UV2) and two independent elements for over-voltage (OV1 & OV2). The two levels allow for discrete alarm setting and trip settings, each with a separate pick-up and time delay setting. The undervoltage elements also incorporate a hysteresis setting, in order to allow the pick-up/drop-off ratio of the elements to be set. Undervoltage blocking detectors can be used to prevent nuisance alarms when the voltage inputs of the system are not energised.

The voltage elements can be used to protect generators against over-voltages, motors against loss of supply, or be applied as backup protection in the event of defective system regulating equipment.

1.1 Analogue Inputs

The input stage measures all three voltage quantities over the range of 5 Vrms to 90 Vrms it maintains accuracy within $\pm1\%$ (or 0.25V) over the declared frequency performance range. The measuring range of the input stage allows for phase-neutral connections e.g. 63.5Vrms nominal voltages.

1.2 Measuring Principles

The main signal processing algorithm in the relay is a discrete Fourier transform (DFT) which is performed on each phase input. The DFT extracts the power system fundamental frequency component from the input voltages, effectively filtering out noise, D.C. and harmonics. The DFT is tuned for either 50 or 60Hz (depending upon the system frequency setting) and will calculate the real and imaginary components for each voltage input. These are then used to derive the magnitude quantity, which is then scaled to give a RMS value. Part of the DFT calculation includes extra filtering which smoothes the real and imaginary components, giving reduced ripple on the RMS calculation for off-system frequency conditions. In addition, a lookup table is used to compensate for magnitude variations from the output of the RMS calculation for 47-62Hz frequencies.

The real and imaginary components output from the DFT module are also used to derive the phase of the input signal.

2 Protection Functions

2.1 Voltage Blocking Element

The voltage blocking element acts as a block to the Voltage elements in the relay. If all phase voltages fall below the threshold level then the blocking operation will operate.

The setting range for the voltage blocking threshold is ENABLED/DISABLED, 3V - 60V in steps of 0.5V. This element is required for under-voltage operation conditions. Under normal circumstances, if all phase voltages fall below the under-voltage setting, the undervoltage element will operate. However, in some applications e.g. auto-reclose schemes, having an under-voltage relay trip when the line is de-energised during the auto-reclose sequence is not usually desirable. Blocking the under-voltage operation in this situation can be achieved by using the Voltage Blocking Threshold, which should generally be set above the level of expected induced voltages on the line.

Also it is undesirable to have an undervoltage alarm raised when the line is de-energised – the voltage blocking element can be used to prevent nuisance alarms.

2.2 Voltage Elements

The relay has 4 voltage elements as standard. These are configured as two under-voltage elements (UV1 and UV2, either of which can be used as alarms or trips) and two over-voltage elements (defined as OV Alarm, and OV Trip). If the input voltage(s) exceed the pickup level, whether U/V or O/V, then each element operates through a gate, which selects operation from any one phase or all phases. At this point the element can still be inhibited from starting if the input voltages are below the voltage blocking threshold level.

The undervoltage elements each have a variable Hysteresis setting which allows the user to vary the pick-up / drop-off ratio for a particular element.
[N.B. Remember that for an undervoltage element with hysteresis the pick-up of the element will occur at a lower voltage than the drop-off.]

The relay measures the voltage between each phase and neutral and will react to whichever phase exceeds the setting. If the setting is exceeded an LED is illuminated displaying over-voltage trip or alarm.

Data storage can only be initiated from a trip condition, either by operation of the Overvoltage trip output or operation of either UV1 or UV2 if tripping for that element is enabled.

The voltage elements are instantaneous transient free elements, which have independent DTL timers. The output can be set to 0s for instantaneous operation or time delayed up to 1000 ms.

To switch on the over-voltage functions they first have to be enabled in the AUXILIARY PROTECTION MENU. If the function is not enabled any applied settings for that function is ignored.

SIEMENS
siemens-russia.com