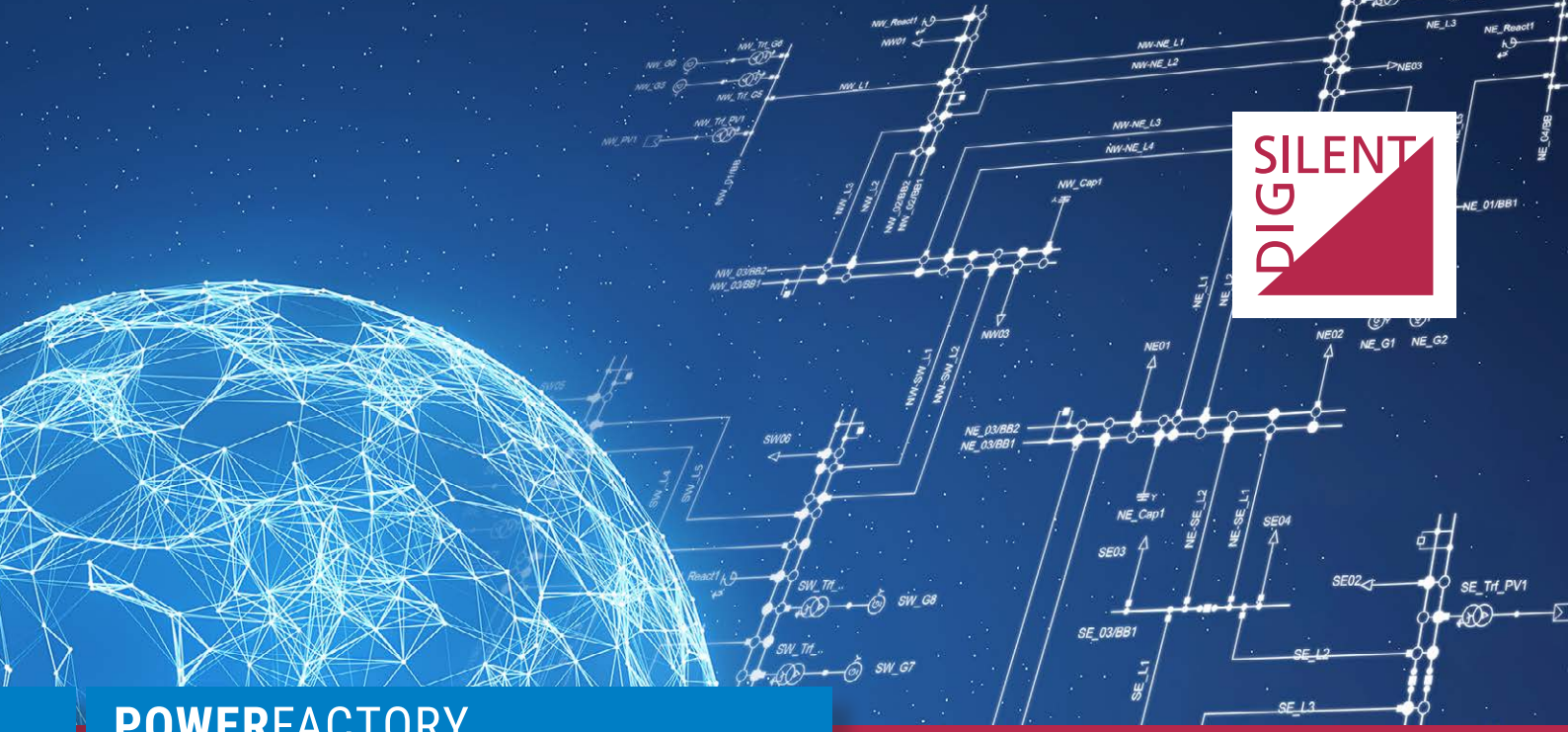

POWERFACTORY

PowerFactory 2021

Technical Reference

SEL 311L

PF2021

POWER SYSTEM SOLUTIONS

MADE IN GERMANY

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Contents

1 Model information

Manufacturer SEL

Model 311L

Variants The SEL 311L PowerFactory relay models can be used to simulate the different firmware versions of the SEL 311L protective relays. The reference firmware version used to implement the models is SEL-311L-R106-V0-Z003002-D20020826 and SEL-311L-6-R106-V0-Z003002-D20020826. However please consider that the models have been implemented with a reduced set of the features available in the relays.

2 General description

The SEL 311L relay protects, controls, and monitors EHV, HV, and sub transmission lines. The relay contains all protective elements and control logic to protect any overhead transmission line.

The SEL 311L PowerFactory relay models consist of a main scheme and of a subrelay which models the out of step and the power swing detection feature.

The following model versions are available:

- SEL 311L-1A
- SEL 311L-5A

The relay models have been implemented trying to simulate the most commonly used protective functions.

The relay models contain the measurement and acquisition units, three differential elements, the polarizing elements, the directional element for the distance elements, the mho and the polygonal distance elements, a set of timers, the overcurrent elements, the voltage elements, the frequency elements, and the output logic.

The model implementation has been based on the information available in the relay manual [1].

3 Supported features

3.1 Measurement and acquisition

The voltage, the current and the frequency are measured locally by one three phase current transformer (”Ct” block) and one three phase voltage transformer (”Vt” block). One additional three phase current transformer (”Ct 2” block) provides the measurement of the phase current at the other end of the line ad simulates the measurements made by a remote SEL 311L relay.

Five measurement units (”Measurement”, ”Measurement 2”, ”Mea Idelta”, ”Measurement seq” and ”Meas Freq” block) are fed by these CTs and this VT.

3.1.1 Available Units

- One three phase current transformers measuring locally the phase currents (”Ct” block).
- One three phase current transformers measuring the remote phase currents (”Ct 2” block).
- One three phase voltage transformer measuring the phase voltages(”Vt” block).
- One three phase measurement element calculating both the local current and voltage values (”Measurement” block).
- One three phase measurement element calculating the local phase to phase currents (”Mea Idelta” block).
- One three phase measurement element calculating the local current and the voltage sequence vectors (”Measurement seq” block).
- One three phase measurement element calculating the remote current values (”Measurement 2” block).
- One frequency measurement element (”Meas Freq” block).

3.1.2 Functionality

The input current and voltage values are sampled at 20 samples/cycle. The values are processed by a DFT filter, operating over a cycle, which then calculates the voltage and current values used by the protective elements.

The ”Mea Idelta” block calculates the phase-phase current values used by the phase-phase loop distance elements.

The ”Meas Freq” measures the frequency using a selectable voltage; by default the phase a - phase b voltage is used.

3.1.3 Data input

Please select the relay version accordingly with the input rated current value (1 A or 5 A).

3.2 Main Relay protective elements

The differential elements, the overcurrent starting elements, the polarizing elements, the directional element, the polygonal and the mho distance elements are working together to simulate the SEL 311L distance functionalities. The ancillary overcurrent elements, the voltage and the frequency protective elements are also modeled.

3.2.1 Available Units

- One phase differential element (”Phase Differential” block).
- One ground differential elements (”Ground Differential” block).
- On negative sequence differential element (”I2 Differential” block).
- Four phase starting elements (”50PP1”, ”50PP2”, ”50PP3” and ”50PP4” block).
- Four ground starting elements (”50G1/50L1”, ”50G2/50L2”, ”50G3/50L3” and ”50G4/50L4” block).
- Two polarizing elements (”Pol-Z” and ”Pol-Z 2-3-4” block).
- One directional element (”Sel Dir” block).
- Four mho distance elements for the phase loops (”Ph-Ph 1”, ”Ph-Ph 2”, ”Ph-Ph 3” and ”Ph-Ph 4” block).
- Four timers associated to the phase mho elements (”Z1PD”, ”Z2PD”, ”Z3PD” and ”Z4PD” block).
- Four mho distance elements for the ground loops (”Ph-G1”, ”Ph-G2”, ”Ph-G3” and ”Ph-G4” block).
- Four polygonal distance elements for the ground loops (”Ph-Q1”, ”Ph-Q2”, ”Ph-Q3” and ”Ph-Q4” block).
- Four timers associated to the ground polygonal and mho elements (”Z1GD”, ”Z2GD”, ”Z3GD” and ”Z4GD” block).
- One inverse time directional phase overcurrent element (”51P” block).
- Three definite time directional phase overcurrent elements (”67P1”, ”67P2” and ”67P3” block).
- Three definite time phase overcurrent elements (”50P1”, ”50P2” and ”50P3” block).
- One inverse time directional ground overcurrent element (”51G” block).
- Four definite time directional ground overcurrent elements (”67G1”, ”67G2”, ”67G3” and ”67G4” block).
- Four definite time ground overcurrent elements (”50G1”, ”50G2”, ”50G3” and ”50G4” block).
- One inverse time directional negative sequence overcurrent element (”51Q” block).
- Four definite time directional negative sequence overcurrent elements (”67Q1”, ”67Q2”, ”67Q3” and ”67Q4” block).
- Four definite time negative sequence overcurrent elements (”50Q1”, ”50Q2”, ”50Q3” and ”50Q4” block).
- One definite time phase-phase overvoltage element (”59PP” block).

- One definite time phase-ground overvoltage element (”59L” block).
- One definite time positive sequence overvoltage element (”59V1” block).
- One definite time negative sequence overvoltage element (”59Q” block).
- Two definite time residual overvoltage elements (”59N1” and ”59N2” block).
- One definite time phase-phase undervoltage element (”27PP” block).
- One definite time phase-ground undervoltage element (”27L” block).
- Six over/under frequency elements (”81D1”, ”81D2”, ”81D3”, ”81D4”, ”81D5” and ”81D6” block).

3.2.2 Functionality

Differential elements The *Differential* feature consists of the following differential elements:

- Phase line current differential with Generalized Alpha Plane principle.
- Negative sequence current differential with Generalized Alpha Plane principle.
- Zero sequence current differential with Generalized Alpha Plane principle.

The *Generalized Alpha Plane* characteristic is delimited by a ”Restrain Area” defined by a *Radius* and by a *Restrain Angle*.

Please notice that the elements implementing the differential features are represented in the connection scheme as objects belonging to the ”Differential” graphic layer which by default is not visible. The ”Differential” graphic layer must be made visible to allow the visualization of the differential elements.

Overcurrent starting elements Separated sets of overcurrent starting elements are available for the phase-phase and for the phase-ground loops. An overcurrent starting element is available for each distance zone. The phase-ground loop starting elements have both a ground and a phase current threshold.

Directional elements The directional element simulate in detail the SEL 311L negative sequence direction detection logic. The direction of the four mho, of the two polygonal elements and of the overcurrent elements must be set in the directional element dialog. For each inverse time overcurrent element the full set of available direction logics is present:

51P

- M2P (direction controlled by the Zone 2 phase distance element)
- N

51G

- 32QF
- 32QR

- Z2G (direction controlled by the Zone 2 ground distance elements)
- N

51Q

- 32QF
- 32QR
- M2P (direction controlled by the Zone 2 phase distance element)
- Z2G (direction controlled by the Zone 2 ground distance elements)
- N

The ”Loss of potential” logic is also supported.

Polarizing element The polarizing elements are calculating the operating current and voltage and the polarizing voltage vectors used by the polygonal and the mho elements. Separated elements are available for the 1^{st} zone (”Pol-Z” block) and for the other zones (”Pol-Z 2-3-4” block).

Mho elements Separated set of mho elements are monitoring the phase-ground and the phase-phase loops. The starting of the mho elements is controlled by the overcurrent starting elements.

Polygonal elements A set of polygonal elements can be sued to monitor the phase-ground loops. The starting of the ground polygonal elements is controlled by the overcurrent starting elements.

Timers The timers are connected to the mho and to the polygonal output signals. Separated timers are available for the phase and the ground loops. The ground mho and the ground polygonal elements share the same timers.

Overcurrent The inverse time elements (”51P”, ”51G” and ”51Q’ block) are supporting the following inverse time trip characteristics:

- C1 - IEC Class A (Standard Inverse)
- C2 - IEC Class B (Very Inverse)
- C3 - IEC Class C (Extremely Inverse)
- C4 - IEC Long Time Inverse
- U1 - U.S. Moderately Inverse
- U2 - U.S. Inverse
- U3 - U.S. Very Inverse

- U4 - U.S. Extremly Inverse

The inverse time element trip characteristic equations comply with the IEC and ANSI standard equations. Each trip characteristic is associated to an inverse time reset characteristic which can be enabled or disabled by the user.

For each ”type” of overcurrent elements (phase, ground and negative sequence) a double set of elements is available: one set (i.e. ”67P1’, ”67P2”, ”67P3”) consists of the directional elements, one set (i.e. ”50P1’, ”50P2”, ”50P3”) consists of the non directional elements which should be used as instantaneous elements; please notice as the two sets are sharing the same threshold values.

3.2.3 Data input

The relationships between the relay settings and the model parameters can be found in the following tables (the relay model parameter names are listed between brackets):

Differential elements :

Address	Relay Setting	Model block	Model setting	Note
	87LPP	Phase Differential	Differential Current base threshold (Id-iffr)	
	87L2P	Negative Sequence Differential	Differential Current base threshold (Id-iffr)	
	87LGP	Ground Differential	Differential Current base threshold (Id-iffr)	
	87LR	Phase Differential	Restraint region Radius (RestrRadius)	
		Ground Differential	Restraint region Radius (RestrRadius)	
		I2 Differential	Restraint region Radius (RestrRadius)	
	87LANG	Phase Differential	Restraint region Angle (RestrAngle)	
		Ground Differential	Restraint region Angle (RestrAngle)	
		I2 Differential	Restraint region Angle (RestrAngle)	

Starting elements :

Address	Relay Setting	Model block	Model setting	Note
	50PP1	50PP1	Current I>> (Ip2)	
	50PP2	50PP2	Current I>> (Ip2)	
	50PP3	50PP3	Current I>> (Ip2)	
	50PP4	50PP4	Current I>> (Ip2)	
	50L1	50G1/50L1	Current I>> (Ip2)	
	50L2	50G2/50L2	Current I>> (Ip2)	
	50L3	50G3/50L3	Current I>> (Ip2)	
	50L4	50G4/50L4	Current I>> (Ip2)	
	50GZ1	50G1/50L1	Current, 3*I0 (Ie)	
	50GZ2	50G2/50L2	Current, 3*I0 (Ie)	
	50GZ3	50G3/50L3	Current, 3*I0 (Ie)	
	50GZ4	50G4/50L4	Current, 3*I0 (Ie)	

Polarizing element :

Address	Relay Setting	Model block	Model setting	Note
	k0M1	Polarizing	k0 (k0)	
	k0A1	Polarizing	Angle (phik0)	
	k0M	Polarizing 2-3-4	k0 (k0)	
	k0A	Polarizing 2-3-4	Angle (phik0)	

Mho impedance elements :

Address	Relay Setting	Model block	Model setting	Note
	E21P	Ph-Ph 1	Out of Service (outserv)	
		Ph-Ph 2	Out of Service (outserv)	
		Ph-Ph 3	Out of Service (outserv)	
		Ph-Ph 4	Out of Service (outserv)	
	Z1P	Ph-Ph 1	Replica Impedance (Zm)	
	Z2P	Ph-Ph 2	Replica Impedance (Zm)	
	Z3P	Ph-Ph 3	Replica Impedance (Zm)	
	Z4P	Ph-Ph 4	Replica Impedance (Zm)	
	E21MG	Ph-G1	Out of Service (outserv)	
		Ph-G2	Out of Service (outserv)	
		Ph-G3	Out of Service (outserv)	
		Ph-G4	Out of Service (outserv)	
	Z1MG	Ph-G1	Replica Impedance (Zm)	
	Z2MG	Ph-G2	Replica Impedance (Zm)	
	Z3MG	Ph-G3	Replica Impedance (Zm)	
	Z4MG	Ph-G4	Replica Impedance (Zm)	
	Positive-Seq.Line Impedance Angle	Ph-Ph 1	Relay angle (phi)	
		Ph-Ph 2	Relay angle (phi)	
		Ph-Ph 3	Relay angle (phi)	
		Ph-Ph 4	Relay angle (phi)	
	Zero-Seq.Line Impedance Angle	Ph-G1	Relay angle (phi)	
		Ph-G2	Relay angle (phi)	
		Ph-G3	Relay angle (phi)	
		Ph-G4	Relay angle (phi)	

Polygonal impedance elements :

Address	Relay Setting	Model block	Model setting	Note
	E21XG	Ph-Q1	Out of Service (outserv)	
		Ph-Q2	Out of Service (outserv)	
		Ph-Q3	Out of Service (outserv)	
		Ph-Q4	Out of Service (outserv)	
	XG1	Ph-Q1	+X Reach (Xmax)	
	XG2	Ph-Q2	+X Reach (Xmax)	
	XG3	Ph-Q3	+X Reach (Xmax)	
	XG4	Ph-Q4	+X Reach (Xmax)	
	RG1	Ph-Q1	+R Resistance (Rmax)	
	RG2	Ph-Q2	+R Resistance (Rmax)	
	RG3	Ph-Q3	+R Resistance (Rmax)	
	RG4	Ph-Q4	+R Resistance (Rmax)	
	Zero-Seq.Line Impedance Angle	Ph-Q1	Relay angle (phi)	
		Ph-Q2	Relay angle (phi)	

Address	Relay Setting	Model block	Model setting	Note
		Ph-Q3	Relay angle (phi)	
		Ph-Q4	Relay angle (phi)	
	TANG	Ph-Q1	+X Angle (beta)	
		Ph-Q2	+X Angle (beta)	
		Ph-Q3	+X Angle (beta)	
		Ph-Q4	+X Angle (beta)	

Timers :

Address	Relay Setting	Model block	Model setting	Note
	Z1PD	Z1PD	Time Setting (Tcdelay)	
	Z2PD	Z2PD	Time Setting (Tcdelay)	
	Z3PD	Z3PD	Time Setting (Tcdelay)	
	Z4PD	Z4PD	Time Setting (Tcdelay)	
	Z1GD	Z1GD	Time Setting (Tcdelay)	
	Z2GD	Z2GD	Time Setting (Tcdelay)	
	Z3GD	Z3GD	Time Setting (Tcdelay)	
	Z4GD	Z4GD	Time Setting (Tcdelay)	

Directional element (”Sel Dir”) :

Address	Relay Setting	Model block	Model setting	Note
	ORDER	Sel Dir	Ground directional element priority(ORDER)	
	DIR1	Sel Dir	Level 1 direction (DIR1)	In the ”Basic settings" tab page
	DIR2	Sel Dir	Level 2 direction (DIR2)	In the ”Basic settings" tab page
	DIR3	Sel Dir	Level 3 direction (DIR3)	In the ”Basic settings" tab page
	DIR4	Sel Dir	Level 4 direction (DIR4)	In the ”Basic settings" tab page
	51PTC	Sel Dir	Phase(51P) Torque Control	
	51GTC	Sel Dir	Residual(51N) Torque Control	
	51QTC	Sel Dir	Negative Sequence(51Q) Torque Control	
	Z2F	Sel Dir	Forward directional Z2 threshold Z2F	In the ”Negative sequence” tab page
	50QF	Sel Dir	Forward directional current threshold (s50QF)	In the ”Negative sequence” tab page
	Z2R	Sel Dir	Reverse directional Z2 threshold Z2R	In the ”Negative sequence” tab page
	50QR	Sel Dir	Reverse directional current threshold (s50QR)	In the ”Negative sequence” tab page
	a2	Sel Dir	Positive sequence current restraint factor a2=I2/I1	In the ”Negative sequence” tab page
	a0	Sel Dir	Zero sequence current restraint factor a0=I0/I1	In the ”Ground” tab page
	k2	Sel Dir	Zero sequence current restraint factor k2=I2/I0	In the ”Negative sequence” tab page
	ELOP	Sel Dir	Loss Of Potential enable setting (ELOP)	In the ”Basic settings" tab page
	Z1MAG	Sel Dir	Positive sequence line impedance magnitude Z1MAG (Zm)	In the ”Negative sequence” tab page
	Z1ANG	Sel Dir	Positive sequence line impedance angle Z1ANG (phi)	In the ”Negative sequence” tab page

Address	Relay Setting	Model block	Model setting	Note
	50GFP	Sel Dir	Forward directional residual ground pickup 50GFP (s50GFP)	In the "Ground" tab page
	50GRP	Sel Dir	Reverse directional residual ground pickup 50GRP (s50GRP)	In the "Ground" tab page
	Z0F	Sel Dir	Forward directional Z0 threshold Z0F	In the "Ground" tab page
	Z0R	Sel Dir	Reverse directional Z0 threshold Z0R	In the "Ground" tab page
	Z0MAG	Sel Dir	Zero sequence line impedance magnitude Z0MAG (Z0)	In the "Ground" tab page
	Z0ANG	Sel Dir	Zero sequence line impedance angle Z0ANG (phi0)	In the "Ground" tab page

Overcurrent :

Address	Relay Setting	Model block	Model setting	Note
	E51P	51P	Out of Service (outserv)	
	51PP	51P	Current Setting (Ipsetr)	
	51PC	51P	Characteristic(pcharac)	
	51PTD	51P	Time Dial (Tpset)	
	51PTC	Sel Dir	Phase(51P) Torque Control (s51PTC)	
	51PRS	51P	Reset Characteristic (restedis)	
	E51G	51G	Out of Service (outserv)	
	51GP	51G	Current Setting (Ipsetr)	
	51GC	51G	Characteristic(pcharac)	
	51GTD	51G	Time Dial (Tpset)	
	51GTC	Sel Dir	Residual(51N) Torque Control (s51PTC)	
	51GRS	51G	Reset Characteristic (restedis)	
	E51Q	51Q	Out of Service (outserv)	
	51QP	51Q	Current Setting (Ipsetr)	
	51QC	51Q	Characteristic(pcharac)	
	51QTD	51Q	Time Dial (Tpset)	
	51QTC	Sel Dir	Negative Sequence(51Q) Torque Control (s51QTC)	
	51QRS	51Q	Reset Characteristic (restedis)	
	E50P	50P1	Out of Service (outserv)	
		50P2	Out of Service (outserv)	
		50P3	Out of Service (outserv)	
		50P4	Out of Service (outserv)	
		67P1	Out of Service (outserv)	
		67P2	Out of Service (outserv)	
		67P3	Out of Service (outserv)	
		67P4	Out of Service (outserv)	
	50P1	50P1	Pickup Current (Ipsetr)	
		67P1	Pickup Current (Ipsetr)	
	50P2	50P2	Pickup Current (Ipsetr)	
		67P2	Pickup Current (Ipsetr)	
	50P3	50P3	Pickup Current (Ipsetr)	
		67P3	Pickup Current (Ipsetr)	
	50P4	50P4	Pickup Current (Ipsetr)	
		67P4	Pickup Current (Ipsetr)	
	67P1D	67P1	Time Setting (cTset)	
	67P2D	67P2	Time Setting (cTset)	
	67P3D	67P3	Time Setting (cTset)	
	67P4D	67P4	Time Setting (cTset)	

Address	Relay Setting	Model block	Model setting	Note
	E50G	50G1	Out of Service (outserv)	
		50G2	Out of Service (outserv)	
		50G3	Out of Service (outserv)	
		50G4	Out of Service (outserv)	
		67G1	Out of Service (outserv)	
		67G2	Out of Service (outserv)	
		67G3	Out of Service (outserv)	
		67G4	Out of Service (outserv)	
	50G1	50G1	Pickup Current (Ipsetr)	
		67G1	Pickup Current (Ipsetr)	
	50G2	50G2	Pickup Current (Ipsetr)	
		67G2	Pickup Current (Ipsetr)	
	50G3	50G3	Pickup Current (Ipsetr)	
		67G3	Pickup Current (Ipsetr)	
	50G4	50G4	Pickup Current (Ipsetr)	
		67G4	Pickup Current (Ipsetr)	
	67G1D	67G1	Time Setting (cTset)	
	67G2D	67G2	Time Setting (cTset)	
	67G3D	67G3	Time Setting (cTset)	
	67G4D	67G4	Time Setting (cTset)	
	E50Q	50Q1	Out of Service (outserv)	
		50Q2	Out of Service (outserv)	
		50Q3	Out of Service (outserv)	
		50Q4	Out of Service (outserv)	
		67Q1	Out of Service (outserv)	
		67Q2	Out of Service (outserv)	
		67Q3	Out of Service (outserv)	
		67Q4	Out of Service (outserv)	
	50Q1	50Q1	Pickup Current (Ipsetr)	
		67Q1	Pickup Current (Ipsetr)	
	50Q2	50Q2	Pickup Current (Ipsetr)	
		67Q2	Pickup Current (Ipsetr)	
	50Q3	50Q3	Pickup Current (Ipsetr)	
		67Q3	Pickup Current (Ipsetr)	
	50Q4	50Q4	Pickup Current (Ipsetr)	
		67Q4	Pickup Current (Ipsetr)	
	67Q1D	67Q1	Time Setting (cTset)	
	67Q2D	67Q2	Time Setting (cTset)	
	67Q3D	67Q3	Time Setting (cTset)	
	67Q4D	67Q4	Time Setting (cTset)	

Voltage :

Address	Relay Setting	Model block	Model setting	Note
	EVOLT	27P	Out of Service (outserv)	
		59P	Out of Service (outserv)	
		59N1	Out of Service (outserv)	
		59N2	Out of Service (outserv)	
		59Q	Out of Service (outserv)	
		59V1	Out of Service (outserv)	
		27PP	Out of Service (outserv)	
		59PP	Out of Service (outserv)	
	27P	27L	Pickup Voltage (Usetr)	
	59P	59L	Pickup Voltage (Usetr)	

Address	Relay Setting	Model block	Model setting	Note
	59N1	59N1	Pickup Voltage (Usetr)	
	59N2	59N2	Pickup Voltage (Usetr)	
	59Q	59Q	Pickup Voltage (Usetr)	
	59V1	59V1	Pickup Voltage (Usetr)	
	27PP	27PP	Pickup Voltage (Usetr)	
	59PP	59PP	Pickup Voltage (Usetr)	

Frequency :

Address	Relay Setting	Model block	Model setting	Note
	E81	81D1	Out of Service (outserv)	
		81D2	Out of Service (outserv)	
		81D3	Out of Service (outserv)	
		81D4	Out of Service (outserv)	
		81D5	Out of Service (outserv)	
	81D1	81D1	Frequency (Fset)	
	81D1	81D1	Time Delay (cTdel)	
	81D2	81D2	Frequency (Fset)	
	81D2	81D2	Time Delay (cTdel)	
	81D3	81D3	Frequency (Fset)	
	81D3	81D3	Time Delay (cTdel)	
	81D4	81D4	Frequency (Fset)	
	81D4	81D4	Time Delay (cTdel)	
	81D5	81D5	Frequency (Fset)	
	81D5	81D5	Time Delay (cTdel)	

3.3 Out of Step subrelay

The *Out of Step* subrelay implements the out of step and the power swing detection logic.

3.3.1 Available Units

- Two polygonal zones defining the power swing detection area (”Zone 5” and ”Zone 6” block).
- One minimum current activation threshold (”I supervision” block).
- One power swing and out of step detection element (”Out Of Step” block).
- One timer associated to the out of step trip signal (”OS Time Delay” block).

3.3.2 Functionality

The power swing detection area is defined by two polygonal zones: please notice that one zone (”Zone 6”) contains the second one (”Zone 5”) and no intersection is present between the zones. The power swing condition is declared when the system impedance point is in the area defined between the two polygonal zones for a time greater than an user definable setting (”tP1” in the "Timers" tab of the ”OS Time Delay” element dialog). The power swing block is disabled after 2 seconds. The number of the distance zones blocked by the power swing detector can be configured by the user. The out of step condition is declared when the system impedance point intersects in sequence both the internal and the external polygonal zone. The out of step trip signal can be delayed by an additional timer (”OS Time Delay”).

3.3.3 Data input

The relationships between the relay settings and the model parameters can be found in the following table:

Address	Relay Setting	Model block	Model setting	Note
	EOOS	Out Of Step	Out of Step (ioos)	
	OOSB1	Out Of Step	Blocking Configuration (iblockconf)	Select ”All zones Blocking Configuration” or ”Z1 Blocking Configuration” or ”Z1 & Z2 Blocking Configuration”
	OOSB2	Out Of Step	Blocking Configuration (iblockconf)	Select ”All zones Blocking Configuration” or ”Z1 & Z2 Blocking Configuration” or ”Z2=> Blocking Configuration”
	OOSB3	Out Of Step	Blocking Configuration (iblockconf)	Select ”All zones Blocking Configuration” or ”Z2=> Blocking Configuration”
	OOSB4	Out Of Step	Blocking Configuration (iblockconf)	Select ”All zones Blocking Configuration” or ”Z2=> Blocking Configuration”
	OSBD	Out Of Step	tP1 (TtP1)	In the ”Timer” tab page
	OSTD	OS Time Delay	Time Setting (Tcdelay)	
	X1T5	Zone 5	+X Reach (Xmax)	
	X1B5	Zone 5	-X Reach (Xmin)	
	R1R5	Zone 5	+R Resistance (Rmax)	
	R1L5	Zone 5	-R Resistance (Rmin)	
	X1T6	Zone 6	+X Reach (Xmax)	
	X1B6	Zone 6	-X Reach (Xmin)	
	R1R6	Zone 6	+R Resistance (Rmax)	

Address	Relay Setting	Model block	Model setting	Note
	R1L6 50ABC	Zone 6 I supervision	-R Resistance (Rmin) Pickup Current (Ipsetr)	

3.4 Output logic

The output logic is the interface between the relay and the power system. A set of relay output signals is available and can be configured by the user to implement any control logic.

3.4.1 Available Units and Signals

The trip logic is implemented by the "Logic" block. Twenty two relay output signals are available (”OUT1”, ”OUT2”, ”OUT3” . . . ”OUT22”)

By default the unique active relay output signal is ”OUT1”.

3.4.2 Functionality

The ”Logic” block operates the power breaker when a trip command has been issued by any protective element. The block output signal used to operate the breaker is ”OUT1”. The behavior of the other output signals, the trip logic and any special logic implemented in the relay by a SELOGIC control equation can be configured in the "Logic" tab page of the "Logic" block dialog.

3.4.3 Data input

Please disable the ”Logic” block to disable the relay model ability to open the power circuit.

4 Features not supported

The following features are not supported:

- Permissive Overreaching scheme (POTT).
- Directional Comparison Unblocking scheme.
- Directional Comparison Blocking scheme.
- Zone 1 extension.
- Remote End Just Opened.
- Switch Onto Fault.
- Positive Sequence Remote Bus Overvoltage element (”59PR” element).
- Polarization ”Non-Homogeneous Correction Angle”.
- Stub Protection.
- Pole Discordance.
- Out of step.
- Reclosing feature.
- Load encroachment feature.
- Synchro Check.
- Channel VS voltage elements.
- Phase undervoltage block.

5 References

[1] Schweitzer Engineering Laboratories, 2350 NE Hopkins Court Pullman, WA USA 99163-5603. *SEL-311L/SEL-311L-6 LINE CURRENT DIFFERENTIAL PROTECTION AND AUTOMATION SYSTEM INSTRUCTION MANUAL 20020826*, 2002.