



POWERFACTORY

PowerFactory 2021

Technical Reference

SEL 279

PF2021

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

Publisher:

DlgSILENT GmbH
Heinrich-Hertz-Straße 9
72810 Gomaringen / Germany
Tel.: +49 (0) 7072-9168-0
Fax: +49 (0) 7072-9168-88
info@digsilent.de

Please visit our homepage at:
<https://www.digsilent.de>

Copyright © 2021 DlgSILENT GmbH

All rights reserved. No part of this
publication may be reproduced or
distributed in any form without written
permission of DlgSILENT GmbH.

May 6, 2019
PowerFactory 2021
Revision 892

Contents

1 Model information	1
2 General description	1
3 Supported features	2
3.1 Measurement and acquisition	2
3.1.1 Available Units and input signals	2
3.1.2 Functionality	2
3.1.3 Data input	2
3.2 Main Relay protective elements	3
3.2.1 Available Units	3
3.2.2 Functionality	3
3.2.3 Data input	3
3.3 Output logic	5
3.3.1 Available Units and Signals	5
3.3.2 Functionality	5
3.3.3 Data input	5
4 Features not supported	6
5 References	7

1 Model information

Manufacturer SEL

Model 279

Variants The SEL 279 PowerFactory relay model can be used to simulate the different firmware versions of the SEL 279 protective relays. The reference firmware version used to implement the model is SEL-279H-R407 and SEL-279H-R457. However please consider that the model has been implemented with a reduced set of the features available in the relays.

2 General description

The SEL 279 relay is a reclosing relay controlling one or two breakers for delayed and high speed reclosures. It includes logic and elements for restoration, test and the synchronism check, separate timers per breaker for single pole and three pole reclosures, SELlogic control equations for custom reclosing and control schemes.

The SEL 279 PowerFactory relay model consist of a monolithic scheme. An unique relay model version is available.

The relay model consists of the measurement and acquisition units, the reclosing elements, the voltage elements and the output logic.

The model has been conceived to be used together with at least one protective relay that trips the breaker. The trip signal of the protective relay must be sent to an instance of the SEL 279 relay model to start the reclosing sequence. The SEL 279 relay and the other protective relay must be linked together by an external scheme. Inside the SEL 279 relay model the "Reclosing link" generic interconnection scheme can be found and can be used at this purpose.

The model implementation has been based on the information available in the relay manual [1] [2].

3 Supported features

3.1 Measurement and acquisition

The primary voltages are converted by two 3phase voltage transformers ("Vt Line" and "Vt Bus" block)

Two measurement elements ("Measurement line" and "Measurement bus" block) are fed by these VTs.

3.1.1 Available Units and input signals

The measurement part of the relay model consists of the following elements:

- Two 3 phase voltage transformers converting the phase voltages ("Vt Line" and "Vt Bus" block).
- Two 3 phase measurement elements calculating the phase-ground voltage RMS values ("Measurement bus" and "Measurement bus" block).

The following relay input signals are available:

- w_trip(1) (connected to the "Phase reclogic breaker 1" block)
- w_trip(2) (connected to the "Phase reclogic breaker 2" block)

The "Reclosing Link" interconnection scheme available in the relay model folder, shows how to connect to an instance of the SEL 279 relay model ("R2" in the scheme) the protective relay ("R1" in the scheme) which sends the trip command. Please configure the names of the protective relay trip signals accordingly with the names of the available relay output signals. Two protective relays can be used modifying the interconnection scheme.

3.1.2 Functionality

The voltage is measured at two different system location (along a line and along the bus bar). This is required to implement any synchronism scheme.

The input voltages are sampled at 10 samples/cycle. The values are processed by a Cosine filter, operating over a cycle, which then calculates the voltage values used by the protective elements.

3.1.3 Data input

No user input is required.

3.2 Main Relay protective elements

The reclosing elements and the voltage elements are working together to simulate the SEL 279 reclosing functionalities.

3.2.1 Available Units

- Two 3phase reclosing elements ("Phase reclogic breaker 1" and "Phase reclogic breaker 2" block).
- Two time constant undervoltage elements ("27B (Dead bus)" and "27L (Dead line)" block).
- Two time constant overvoltage elements ("59B (Hot bus)" and "59L (Hot line)" block).
- One voltage detector element ("0 voltage detector" block).

3.2.2 Functionality

Voltage elements The undervoltage ("27B (Dead bus)" and "27L (Dead line)" block) and the overvoltage elements ("59B (Hot bus)" and "59L (Hot line)" block) output signals are directly available as relay output signals (see 3.3) and can be used to implement any control logic which requires info regarding the energization status of a bus bar and of a line.

The "27B (Dead bus)" block and the "59B (Hot bus)" block are fed by the "Measurement bus" measurement element, the "27L (Dead line)" block and the "59L (Hot line)" block are fed by the "Measurement line" measurement element.

Reclosing elements The two reclosing elements are driven by the relay input signals ("w_trip(1)" and "w_trip(2)"). The SEL 279 relay model reclosing feature is operating only when such signals are carrying the trip signals generated by an external scheme (typically a protection relay not containing the reclosing feature).

Different *Open Interval times* can be inserted for the first reclosing attempt and for the following. A different *Open Interval times* can be defined for the first reclosing attempt after that a single phase trip has been detected. The reclosing logic can be defined in the "Logic" tab page.

The voltage detector element ("0 voltage detector" block) is used to detect the open breaker condition.

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):

Reclosing feature :

Address	Relay Setting	Model block	Model setting	Note
	SOI1	Phase reclogic breaker 1	Reclosing int 1 1Ph-Grnd faults (cre-cltime11ph)	
	SOI2	Phase reclogic breaker 2	Reclosing int 1 1Ph-Grnd faults (cre-cltime11ph)	

3 Supported features

Address	Relay Setting	Model block	Model setting	Note
	3OI1	Phase reclogic breaker 1	Reclosing interval 1 (crecltime1)	
	3OI2	Phase reclogic breaker 2	Reclosing interval 2 (crecltime2)	
	79RS	Phase reclogic breaker 1	Reclosing interval 1 (crecltime1)	
		Phase reclogic breaker 2	Reclosing interval 2 (crecltime2)	
	79RS	Phase reclogic breaker 1	Reset Time (cresetime)	
		Phase reclogic breaker 2	Reset Time (cresetime)	
	M79SH	Phase reclogic breaker 1	Operations to lockout (oplockout)	
		Phase reclogic breaker 2	Operations to lockout (oplockout)	

Voltage :

Address	Relay Setting	Model block	Model setting	Note
	27B	27B (Dead bus)	Pickup Voltage (Usetr)	
	27L	27L (Dead line)	Pickup Voltage (Usetr)	
	59B	59B (Hot bus)	Pickup Voltage (Usetr)	
	59L	59L (Hot line)	Pickup Voltage (Usetr)	

3.3 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 used by the user to implement any control logic using external control schemes.

3.3.1 Available Units and Signals

The trip logic is implemented by the "Output Logic breaker 1" and by the "Output Logic breaker 2" block, the reclosing logic by the "Closing logic breaker 1" block and by the "Closing logic breaker 2" block.

The following relay output signals are available:

- *27B* (dead bus voltage trip signal)
- *59B* (hot bus voltage trip signal)
- *27L* (dead line voltage trip signal)
- *59L* (hot line voltage trip signal)
- *yout* ("Phase reclogic breaker 1" *close* command)
- *yout1* ("Phase reclogic breaker 1" *trip* command)
- *yout2* ("Phase reclogic breaker 2" *close* command)
- *yout3* ("Phase reclogic breaker 1" *trip* command)

3.3.2 Functionality

The "Output Logic breaker 1" block operates the power breaker #1 when a trip condition has been detected by the recloser element associated to the breaker #1 ("Phase reclogic breaker 1" block). With the same logic the "Output Logic breaker 2" block operates the power breaker #2 when a trip condition has been detected by the recloser element associated to the breaker #2 ("Phase reclogic breaker 2" block).

The "Closing logic breaker 1" block closes the power breaker #1 when the recloser element associated to the breaker #1 triggers a reclosing attempt ("Phase reclogic breaker 1" block). The "Closing logic breaker 2" block closes the power breaker #2 when the recloser element associated to the breaker #2 triggers a reclosing attempt ("Phase reclogic breaker 2" block).

3.3.3 Data input

Please disable the "Output Logic breaker 1" and the "Output Logic breaker 2" block to disable the relay model ability to open the power breaker. Please disable the "Closing logic breaker 1" and the "Closing logic breaker 2" block to disable the relay model ability to close the power breaker.

4 Features not supported

The following features are not supported:

- Synchrocheck feature.
- Synchronism check Difference Voltage (25DV).
- General purpose timers.
- Port timeout delay.

5 References

- [1] SCHWEITZER ENGINEERING LABORATORIES, 2350 NE HOPKINS COURT PULLMAN, WA USA 99163-5603. *SEL 279-H TWO BREAKER RECLOSING RELAY VOLTAGE RELAY SYNCHRONISM CHECK RELAY Date Code 941208 Rev. 1*, December 1994.
- [2] SCHWEITZER ENGINEERING LABORATORIES, 2350 NE HOPKINS COURT PULLMAN, WA USA 99163-5603. *SEL 279-H TWO BREAKER RECLOSING RELAY VOLTAGE RELAY SYNCHRONISM CHECK RELAY Date Code 940927*, September 1994.