



POWERFACTORY

PowerFactory 2021

Technical Reference

Siemens 7SJ600

PF2021

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

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1 Model information

Manufacturer Siemens

Model 7SJ600

Variants This model covers most of the features present in the Siemens SIPROTEC 7SJ600, 7SJ601 and 7SJ602 relay

2 General description

The Siemens 7SJ600 relay has been modeled using two PowerFactory relay models:

- 7SJ6001-xxAx0-0DA0 simulating the 1A nominal current relay
- 7SJ6005-xxAx0-0DA0 simulating the 5A nominal current relay

They include most of the protective elements available in the relay.

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

3 Supported features

3.1 Measurement and acquisition

It represents the interface between the power system and the relay protective elements. The currents flowing in the power system are converted by an element simulating the 3 phase CT; the secondary currents are then measured by an element modeling the analog filter of the relay.

3.1.1 Available Units

- one 3ph current transformer ("Ct-3p" block)
- one measurement element ("Measure" block)

3.1.2 Functionality

The "Ct-3p" block represents an ideal CT. Using the CT default configuration the current at the primary side are converted to the secondary side using the CT ratio. The CT saturation and/or its magnetizing characteristic are not considered. Please set the "Detailed Model" check box in the "Detailed Data" tab page of the CT dialog and insert the data regarding the CT burden, the CT secondary resistance and the CT excitation parameter if more accurate simulation results are required.

The "Measure" block models second order low pass analog filter with DC component filter; its time constant is 10 ms.

3.1.3 Data input

No manual data input is required.

3.2 Protective elements

A set of inverse time and definite time overcurrent elements is modeling the relay protective functions. The inverse characteristics available in the relay are available as well in the inverse time model blocks.

3.2.1 Available Units

- one 3 phase inverse time overcurrent element ("Ip" block)
- three 3 phase definite time overcurrent elements ("I>", "I>>" and "I>>>" block)
- one zero sequence inverse time overcurrent element ("Iep" block)
- two zero sequence definite time overcurrent elements ("Ie>" and "Ie>>" block)
- two negative sequence definite time overcurrent elements ("I2>" and "I2>>" block)

3.2.2 Functionality

The inverse time overcurrent elements support the following trip characteristics:

- IEC Normal Inverse ("IEC 255-3 inverse" item)
- IEC Very Inverse ("IEC 255-3 very inverse" item)
- IEC Extremely Inverse ("IEC 255-3 extremely inverse" item)
- IEC Long Time Inverse ("IEC 255-3 long inverse" item)
- ANSI/IEEE Inverse ("ANSI/IEEE inverse" item)
- ANSI/IEEE Short inverse ("ANSI/IEEE short inverse" item)
- ANSI/IEEE Long inverse ("ANSI/IEEE long inverse" item)
- ANSI/IEEE Moderately inverse ("ANSI/IEEE moderately inverse" item)
- ANSI/IEEE Very inverse ("ANSI/IEEE very inverse" item)
- ANSI/IEEE Extremely inverse ("ANSI/IEEE extremely inverse" item)
- ANSI/IEEE Definite inverse ("ANSI/IEEE definite inverse" item)
- ANSI/IEEE I-Squared-t ("ANSI/IEEE I squared T" item)

3.2.3 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
1300	O / C Phase	Ip, I>, I>>, I>>>	Out of Service	
1303	I>>>	I>>>	Current Pickup	
1305	I>>	I>>	Current Pickup	
1307	TI>>	I>>	Time Setting	
1308	I>	I>	Current Pickup	
1310	TI>	I>	TimeDial	
1312	CHApHInverse	Ip	Characteristic	
1313	TP	Ip	TimeDial	
1314	CHApHInverse	Ip	Characteristic	
1315	D	Ip	TimeDial	
1316	Ip	Ip	Current Pickup	
1400	O / C Earth	Iep, Ie>, Ie>>	Out of Service	
1402	IE>>	Ie>>	Current Pickup	
1404	TIE>>	Ie>>	Time Setting	
1405	IE>	Ie>	Current Pickup	
1407	TIE>	Ie>	TimeDial	
1409	CHApHInverse	Iep	Characteristic	
1410	TEp	Iep	TimeDial	
1411	CHApHInverse	Iep	Characteristic	
1412	DE	Iep	TimeDial	
1413	Iep	Iep	Current Pickup	
1500	UNBAL LOAD	I2>, I2>>	Out of Service	
1502	I2>	I2>	Current Pickup	
1503	TI2>	I2>	Time Setting	
1504	I2>>	I2>>	Current Pickup	
1505	TI2>>	I2>>	Time Setting	

Please notice that to simulate the relay when the phase definite time characteristic has been activated the "Ip" block must be put out of service and the "I>" block must be activated. Vice versa when an phase inverse time characteristic has been activated the "Ip" block must be activated and set and the "I>" block must be put out of service. The same procedure must be followed for the ground elements activating or deactivating the "IE>" block and the "Iep" block.

3.3 Output logic

It represents the output stage of the relay; it's the interface between the relay and the power breaker.

3.3.1 Available Units

- one output element ("Logic" block)

3.3.2 Functionality

The "Logic" block is collecting the trip signals coming from the protective elements and operating the relay output contacts. The output contacts are "TripPh", "TripE", "TripI2". "TripPh" is asserting when one of the phase protective elements ("Ip", "I>", "I>>" or "I>>>") is tripping, "TripE" is asserting when one of the zero sequence protective elements ("Iep", "Ie>" or "Ie>>") is tripping, "TripI2" when one of the negative sequence protective elements ("I2>" or "I2>>") is tripping.

3.3.3 Data input

To disable the relay model ability to open the power circuit breaker simply disable the "Logic" block. To disable the ability to operate the breaker of only one set of protective elements use the "Tripping Signals" combobox (i.e. select the "TripPh" item if only the phase protective elements are allowed to operate the breaker)

4 Features not supported

The following features are not supported:

- Dynamic pickup values
- Thermal overload protection
- Start-up time monitoring
- Auto-Reclosure

5 References

- [1] Siemens AG, Wittelsbacherplatz 2, 80333 Munich, Germany. *Numerical Time Overcurrent Protection and Thermal Overload Relay with Auto-Reclose Option SIPROTEC 7SJ600 V3.2* Order n. C53000-G1176-C106-9, 2003.