



# POWERFACTORY

# PowerFactory 2021

## Technical Reference

# Siemens 7SJ64

**POWER SYSTEM SOLUTIONS**  
MADE IN GERMANY

F2021

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## 1 Model information

**Manufacturer** Siemens

**Model** 7SJ64

**Variants** These models can be used to simulate the features present in the Siemens SIPROTEC 7SJ64 protective relays up to firmware version V4.6.

## 2 General description

The numerical, multi-functional SIPROTEC 4 7SJ64 is a versatile device designed for many applications. The 7SJ64 can be used as a protective, control, and monitoring device for distribution feeders and transmission lines of any voltage in networks that are grounded, low-resistance grounded, ungrounded, or of a compensated neutral point structure. The device is suited for networks that are radial or looped, and for lines with single or multi-terminal feeds. The 7SJ64 is equipped with motor protection applicable for asynchronous machines of all sizes.

The Siemens 7SJ64 relay has been modeled using eight PowerFactory relay models:

- 7SJ64\_1A-1A 50 Hz (phase and ground rated current equal to 1 A).
- 7SJ64\_1A-1A 60 Hz (phase and ground rated current equal to 1 A).
- 7SJ64\_1A-5A 50 Hz (phase rated current equal to 1 A, ground rated current equal to 5 A).
- 7SJ64\_1A-5A 60 Hz (phase rated current equal to 1 A, ground rated current equal to 5 A).
- 7SJ64\_5A-1A 50 Hz (phase rated current equal to 5 A, ground rated current equal to 1 A).
- 7SJ64\_5A-1A 60 Hz (phase rated current equal to 5 A, ground rated current equal to 1 A).
- 7SJ64\_5A-5A 50 Hz (phase and ground rated current equal to 5 A).
- 7SJ64\_5A-5A 60 Hz (phase and ground rated current equal to 5 A).

They include the phase, ground directional and non directional overcurrent protective elements, the thermal image element, the negative sequence elements, the recloser element, the frequency elements, the overvoltage and the undervoltage elements available in the relay.

The model implementation has been based on the information available in the relay manual [2] [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 which simulates a 3 phase

CT ("Ct-3p" block) and by an element which simulates a single phase core Ct ("Ct-0" block); the voltages are converted by an element which simulates a 3 phase VT ("Vt-3P" block); the secondary currents and voltages are then measured by two elements which model the digital filter of the relay.

#### 3.1.1 Available Units and input signals

- One 3 phase current transformer ("Ct-3p" block).
  - One core current transformer ("Ct-0" block).
  - One 3 phase voltage transformer ("Vt-3P" block).
  - One 3 phase measurement element ("MeasPhase" block).
  - One single phase measurement element ("Meas0Seq" block).
  - One frequency measurement element ("Meas Freq" block).
- 
- *I> 51 iblock* controlling the *Ip 51* element.
  - *I> 67 TOC iblock* controlling *Ip 67 TOC* element.
  - *I>> 50\_1 iblock* controlling the *I> 50\_1* element.
  - *I>> 67\_1 iblock* controlling *I> 67\_1* element.
  - *I>> 50\_2 iblock* controlling the *I>> 50\_2* element.
  - *I>> 67\_2 iblock* controlling *I>> 67\_2* element.
  - *Ie> 51N iblock* controlling the *Iep 51N* element.
  - *Ie> 67N TOC iblock* controlling *Iep 67N TOC* element.
  - *Ie>> 50N\_1 iblock* controlling the *Ie> 50N\_1* element.
  - *Ie>> 67N\_1 iblock* controlling *Ie> 67N\_1* element.
  - *Ie>> 50N\_2 iblock* controlling the *Ie>> 50N\_2* element.
  - *Ie>> 67N\_2 iblock* controlling *Ie>> 67N\_2* element.

#### 3.1.2 Functionality

The "Ct-3p" and the "Ct-0" block represent ideal CTs. 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 input current values are sampled by the "MeasPhase" and the "Meas0Seq" block at 16 samples/cycle. The values are processed by a digital filter, integrating the samples over a cycle, which then calculates the voltage and current RMS values used by the protective elements.

### 3.1.3 Data input

No manual data input is required. Please use the relay model which supports the setting ranges for the connected 3 phase Ct rated current and core Ct rated current.

If no core CT is available please select the 3 phases CT also in the "Ct-0" slot: the earth current will be calculated assuming that an Holmgreen's connection of the phases is used.

## 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 51" block).
- Two 3 phase definite time overcurrent elements ("I> 50\_1", and "I>> 50\_2" block).
- One ground current inverse time overcurrent element ("Iep 51N" block).
- Two ground current definite time overcurrent elements ("Ie> 50N\_1", and "Ie>> 50N\_2" block).
- One directional 3 phase inverse time overcurrent element ("Ip 67 TOC" block).
- Two directional 3 phase definite time overcurrent elements ("I> 67\_1", and "I>> 67\_2" block).
- One phase directional element ("Dir OC" block).
- One directional ground current inverse time overcurrent element ("Iep 67N TOC" block).
- Two directional ground current definite time overcurrent elements ("Ie> 67N\_1", and "Ie>> 67N\_2" block).
- One ground directional element ("Dir EF" block).
- One negative sequence current inverse time overcurrent element ("I2p 46 TOC" block).
- Two negative sequence current definite time overcurrent elements ("Ie> 46\_1", and "Ie>> 46\_2" block).
- One thermal image element ("Overload 49" block).
- Two phase-phase overvoltage elements ("U> 59\_1" and "U>> 59\_2" block).
- Two positive sequence overvoltage elements ("U> 59\_1 V1" and "U>> 59\_2 V1" block).
- Two negative sequence overvoltage elements ("U> 59\_1 V2" and "U>> 59\_2 V2" block).
- Two zero sequence overvoltage elements ("Uo> 64" block).
- Two phase-ground undervoltage elements ("U< 27\_1" and "U<< 27\_2" block).
- Two positive sequence undervoltage elements ("U< 27\_1 V1" and "U<< 27\_2 V1" block).
- Four over/underfrequency elements with common undervoltage blocking element ("81 vmin", "81\_1", "81\_2", "81\_3", and "81\_4" block).
- Two reclosing elements ("Phase Reclosing" and "Ground Reclosing" block).

### 3.2.2 Functionality

The phase and the ground inverse time overcurrent elements ("Ip 51", "Ip 67 TOC", "Iep 51N", and "Iep 67N TOC" block) 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).
- Definite time.
- User Defined 1.
- User Defined 2.
- User Defined 3.
- User Defined 4.
- User Defined 5.

The *User defined x* with x = from 1 to 5 trip characteristics are defined by up to 23 current and time value couples which can be set by the user. The trip characteristic definitions are unique for any instance of the Siemens 7SJ64 relay model and be found in the *TCCs* folder contained inside the *7SJ64* relay model object.

The negative sequence inverse time overcurrent element ("I2p 46 TOC" block) supports the following trip characteristics:

- ANSI/IEEE Inverse ("ANSI/IEEE 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).
- 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).
- Definite time.

Two separated reclosing logics can be set for the phase and the ground overcurrent elements. The "Phase Reclosing" block controls the phase directional and non directional elements ("Ip 51", "I> 50\_1", "I>> 50\_2", "Ip 67 TOC", "I> 67\_1", and "I>> 67\_2" block), the "Ground Reclosing" block controls the ground directional and non directional elements ("Iep 51N", "Ie> 50N\_1", "Ie>> 50N\_2", "Iep 67N TOC", "Ie> 67N\_1", and "Ie>> 67N\_2" block). Each element can be set for each reclosing step in one of the following conditions:

- Disable (it means that the element is out of service in that reclosing step).
- Reclosing (the element is operating in that reclosing step).
- Lockout (the element is operating in that reclosing step and that if it trips it blocks the following reclosing attempt).

The step configuration can be entered in the "Logic" tab page of the "Phase Reclosing" and of the "Ground Reclosing" block. The *Trip 1* column represents the status of the protective blocks before performing any reclosing attempt. Please notice that the *Disable* model parameter value is equivalent to the *blocked*  $T = \infty$  relay setting. *Reclosing* is equivalent to *Set value*  $T = T$ . The *instant*.  $T = 0$  relay setting is not modeled.

The six overvoltage blocks ("U> 59\_1", "U>> 59\_2", "U> 59\_1 V1", "U>> 59\_2 V1", "U> 59\_1 V2", and "U>> 59\_2 V2" block) can be used to simulate the two relay overvoltage elements which, by means of parameter 614 OP. QUANTITY 59, can be configured to evaluate as measured quantities the phase-to-phase voltages, the positive or the negative system voltage. When the phase-to-phase voltages are evaluated only the "U> 59\_1" and the "U>> 59\_2" block must be enabled, when the positive system voltage is evaluated only the "U> 59\_1 V1" and the "U>> 59\_2 V1" block must be enabled, when the negative system voltage is evaluated only the "U> 59\_1 V2" and the "U>> 59\_2 V2" block must be enabled.

The four undervoltage blocks ("U< 27\_1", "U<< 27\_2", "U< 27\_1 V1", and "U<< 27\_2 V1" block) can be used to simulate the two relay undervoltage elements which, by means of parameter 615 OP. QUANTITY 27, can be configured to evaluate as measured quantities the phase-to-phase voltages or the positive system voltage. When the phase-to-phase voltages are evaluated only the "U< 27\_1" and the "U<< 27\_2" block must be enabled, when the positive system voltage is evaluated only the "U< 27\_1 V1" and the "U<< 27\_2 V1" block must be enabled.



### 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
112	Charac. Phase	Ip 51	Out of Service (outserv)	When <i>Disabled</i> in the model put the block out of service
113	Charac. Ground	Ip 51 Iep 51N	Characteristic (pcharac) Out of Service (outserv)	When <i>Disabled</i> in the model put the block out of service
115	67/67TOC	Iep 51N Ip 67 TOC	Characteristic (pcharac) Out of Service (outserv)	When <i>Disabled</i> in the model put the block out of service
116	67N/67N TOC	I2p 67N TOC	Out of Service (outserv)	When <i>Disabled</i> in the model put the block out of service
131	51N IEC CURVE	Ilep 51Ns	Characteristic (pcharac)	When <i>Disabled</i> in the model put the block out of service
131	51N ANSI CURVE	Ilep 51Ns	Characteristic (pcharac)	
140	46	I2p 46 TOC	Out of Service (outserv)	
		I2p 46 TOC	Characteristic (pcharac)	
142	49	Overload 49	Out of Service (outserv)	
150	2759	U> 59_1	Out of Service (outserv)	
		U>> 59_2	Out of Service (outserv)	
		U< 27_1	Out of Service (outserv)	
		U<< 27_2	Out of Service (outserv)	
171	79 Auto Recl.	Phase Reclosing Ground Reclosing	Out of Service (outserv) Out of Service (outserv)	
1201	FCT 5051	Ip 51	Out of Service (outserv)	
		I> 50_1	Out of Service (outserv)	
		I>> 50_2	Out of Service (outserv)	
1202	50-2 PICKUP	I>> 50_2	Current Pickup (Ipsetr)	
1203	50-2 DELAY	I>> 50_2	Time Setting (Tset)	
1204	50-1 PICKUP	I> 50_1	Current Pickup (Ipsetr)	
1205	50-1 DELAY	I> 50_1	Time Setting (Tset)	
1207	51 PICKUP	Ip 51	Current Setting (Ipsetr)	
1208	51 TIME DIAL	Ip 51	Time Dial (Tpset)	
1209	51 TIME DIAL	Ip 51	Time Dial (Tpset)	
1211	51 IEC CURVE	Ip 51	Characteristic (pcharac)	
1212	51 ANSI CURVE	Ip 51	Characteristic (pcharac)	
1301	FCT 50N/51N	Iep 51N	Out of Service (outserv)	
		Ie> 50N_1	Out of Service (outserv)	
		Ie>> 50N_2	Out of Service (outserv)	
1302	50N-2 PICKUP	Ie>> 50N_2	Current Pickup (Ipsetr)	
1303	50N-2 DELAY	Ie>> 50N_2	Time Setting (Tset)	
1304	50N-1 PICKUP	Ie> 50N_1	Current Pickup (Ipsetr)	
1305	50N-1 DELAY	Ie> 50N_1	Time Setting (Tset)	
1307	51N PICKUP	Iep 51N	Current Setting (Ipsetr)	
1308	51N TIME DIAL	Iep 51N	Time Dial (Tpset)	
1309	51N TIME DIAL	Iep 51N	Time Dial (Tpset)	
1311	51N IEC CURVE	Iep 51N	Characteristic (pcharac)	
1312	51N ANSI CURVE	Iep 51N	Characteristic (pcharac)	
1501	FCT 6767	Ip 67 TOC	Out of Service (outserv)	
		I> 67_1	Out of Service (outserv)	

### 3 Supported features

Address	Relay Setting	Model block	Model setting	Note
1502	67-2 PICKUP	I>> 67_2	Out of Service (outserv)	In the <i>Voltage Polarizing</i> tab page
1503	67-2 DELAY	I>> 67_2	Current Pickup (Ipsetr)	
1504	67-1 PICKUP	I> 67_1	Time Setting (Tset)	
1505	67-1 DELAY	I> 67_1	Current Pickup (Ipsetr)	
1507	67 PICKUP	Ip 67 TOC	Time Setting (Tset)	
1508	67 TIME DIAL	Ip 67 TOC	Current Setting (Ipsetr)	
1509	67 TIME DIAL	Ip 67 TOC	Time Dial (Tpset)	
1511	67 IEC CURVE	Ip 67 TOC	Time Dial (Tpset)	
1512	67 ANSI CURVE	Ip 67 TOC	Characteristic (pcharac)	
1515	Normal Load	Dir OC	Characteristic (pcharac)	
1516	67 Direction	Dir OC	Max. Torque Angle (mtau)	
1601	FCT 67N/67N	lep 67N TOC	Tripping Direction (idir)	
		I> 67N_1	Out of Service (outserv)	
		I>> 67N_2	Out of Service (outserv)	
1602	67N-2 PICKUP	I>> 67N_2	Out of Service (outserv)	
1603	67N-2 DELAY	I>> 67N_2	Current Pickup (Ipsetr)	In the <i>Voltage Polarizing</i> tab page
1604	67N-1 PICKUP	I> 67N_1	Time Setting (Tset)	
1605	67N-1 DELAY	I> 67N_1	Current Pickup (Ipsetr)	
1607	67N PICKUP	Ip 67N TOC	Time Setting (Tset)	
1608	67N TIME DIAL	Ip 67N TOC	Current Setting (Ipsetr)	
1609	67N TIME DIAL	Ip 67N TOC	Time Dial (Tpset)	
1611	67N IEC CURVE	Ip 67N TOC	Time Dial (Tpset)	
1612	67N ANSI CURVE	Ip 67N TOC	Characteristic (pcharac)	
1615	Normal Load	Dir EF	Characteristic (pcharac)	
1616	67N Direction		Max. Torque Angle (mtau)	
3108	64-1 VGND	Uo> 64	Tripping Direction (idir)	
3109	64-1 VGND	Uo> 64	Pickup Voltage (Usetr)	
3110	64-1 VGND	Uo> 64	Pickup Voltage (Usetr)	
3111	T-DELAY Pickup	Uo> 64	Pickup Voltage (Usetr)	
4001	FCT 46	I2p 46 TOC	Time Delay (Tdel)	In the <i>Voltage Polarizing</i> tab page
4002	46-2 PICKUP	I2>> 46_2	Out of Service (outserv)	
4003	46-2 DELAY	I2>> 46_2	Current Pickup (Ipsetr)	
4004	46-1 PICKUP	I2> 46_1	Time Setting (Tset)	
4005	46-1 DELAY	I2> 46_1	Current Pickup (Ipsetr)	
4006	46 IEC CURVE	I2p 46 TOC	Time Setting (Tset)	
4007	46 ANSI CURVE	I2p 46 TOC	Characteristic (pcharac)	
4008	46 PICKUP	I2p 46 TOC	Characteristic (pcharac)	
4009	46 TIME DIAL	I2p 46 TOC	Current Setting (Ipsetr)	
4010	46 TIME DIAL	I2p 46 TOC	Time Dial (Tpset)	
4201	FCT 49	Overload 49	Time Dial (Tpset)	
4202	49 K-FACTOR	Overload 49	Reset Delay (ResetT)	
4203	TIME CONSTANT	Overload 49	Out of Service (outserv)	
4207	Kt-FACTOR	Overload 49	Current Setting (Ipsetr)	
5001	FCT 59	U> 59_1	Time Delay (Tdel)	In the <i>Voltage Polarizing</i> tab page
		U>> 59_2	Time Delay (Tdel)	
5002	59-1 PICKUP	U> 59_1	Out of Service (outserv)	
5003	59-1 PICKUP	U> 59_1	Out of Service (outserv)	
5004	59-1 DELAY	U> 59_1	Pickup Voltage (Usetr)	
		U> 59_1 V1	Pickup Voltage (Usetr)	
		U> 59_1 V2	Time Delay (Tdel)	
5005	59-2 PICKUP	U>> 59_2	Time Delay (Tdel)	
5006	59-2 PICKUP	U>> 59_2	Pickup Voltage (Usetr)	
5007	59-2 DELAY	U>> 59_2	Pickup Voltage (Usetr)	
			Time Delay (Tdel)	

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Address	Relay Setting	Model block	Model setting	Note
		U> 59_2 V1	Time Delay (Tdel)	
		U> 59_2 V2	Time Delay (Tdel)	
5015	59-1-V2 PICKUP	U> 59_1 V2	Pickup Voltage (Usetr)	
5016	59-2-V2 PICKUP	U>> 59_2 V2	Pickup Voltage (Usetr)	
5019	59-1-V1 PICKUP	U> 59_1 V1	Pickup Voltage (Usetr)	
5020	59-2-V1 PICKUP	U>> 59_2 V1	Pickup Voltage (Usetr)	
5101	FCT 27	U< 27_1	Out of Service (outserv)	
		U<< 27_2	Out of Service (outserv)	
5102	27-1 PICKUP	U< 27_1	Pickup Voltage (Usetr)	
	27-1 V1 PICKUP	U< 27_1 V1	Pickup Voltage (Usetr)	
5103	27-1 PICKUP	U< 27_1	Pickup Voltage (Usetr)	
	27-1 V1 PICKUP	U< 27_1 V1	Pickup Voltage (Usetr)	
5106	27-1 DELAY	U< 27_1	Time Delay (Tdel)	
5110	27-2 PICKUP	U<< 27_2	Pickup Voltage (Usetr)	
	27-2 V1 PICKUP	U< 27_2 V1	Pickup Voltage (Usetr)	
5111	27-2 PICKUP	U<< 27_2	Pickup Voltage (Usetr)	
	27-2 V1 PICKUP	U< 27_2 V1	Pickup Voltage (Usetr)	
5112	27-2 DELAY	U<< 27_2	Time Delay (Tdel)	
5402	Vmin	81 vmin	Pickup Voltage (Usetr)	
5403	81-1 PICKUP	81_1	Frequency (Fset)	
5404	81-1 PICKUP	81_1	Frequency (Fset)	
5405	81-1 DELAY	81_1	Time Delay (Tdel)	
5406	81-2 PICKUP	81_2	Frequency (Fset)	
5407	81-2 PICKUP	81_2	Frequency (Fset)	
5408	81-2 DELAY	81_2	Time Delay (Tdel)	
5409	81-3 PICKUP	81_3	Frequency (Fset)	
5410	81-3 PICKUP	81_3	Frequency (Fset)	
5411	81-3 DELAY	81_3	Time Delay (Tdel)	
5412	81-4 PICKUP	81_4	Frequency (Fset)	
5413	81-4 PICKUP	81_4	Frequency (Fset)	
5414	81-4 DELAY	81_4	Time Delay (Tdel)	
7101	FCT 79	Phase Reclosing	No-Reclosing (reclno-tactive)	Set the model check box when FCT 79 is OFF
		Ground Reclosing	No-Reclosing (reclno-tactive)	Set the model check box when FCT 79 is OFF
7105	TIME RESTRAINT	Phase Reclosing	Reset Time (resetime)	
		Ground Reclosing	Reset Time (resetime)	
7127	DEADTIME 1: PH	Phase Reclosing	Reclosing interval 1 (re-cltime1)	
		Ground Reclosing	Reclosing interval 1 (re-cltime1)	
7128	DEADTIME 1: G	Phase Reclosing	Reclosing interval 1 (re-cltime1)	
		Ground Reclosing	Reclosing interval 1 (re-cltime1)	
7129	DEADTIME 2: PH	Phase Reclosing	Reclosing interval 2 (re-cltime1)	
		Ground Reclosing	Reclosing interval 2 (re-cltime1)	
7130	DEADTIME 2: G	Phase Reclosing	Reclosing interval 2 (re-cltime1)	
		Ground Reclosing	Reclosing interval 2 (re-cltime1)	
7131	DEADTIME 3: PH	Phase Reclosing	Reclosing interval 3 (re-cltime1)	
		Ground Reclosing	Reclosing interval 3 (re-cltime1)	

### 3 Supported features

Address	Relay Setting	Model block	Model setting	Note
7132	DEADTIME 3: G	Phase Reclosing	Reclosing interval 3 (re-cltime1)	
		Ground Reclosing	Reclosing interval 3 (re-cltime1)	
7133	DEADTIME 4: PH	Phase Reclosing	Reclosing interval 4 (re-cltime1)	
		Ground Reclosing	Reclosing interval 4 (re-cltime1)	
7134	DEADTIME 4: G	Phase Reclosing	Reclosing interval 4 (re-cltime1)	
		Ground Reclosing	Reclosing interval 4 (re-cltime1)	
7135	NUM OF RECL. GND	Ground Reclosing	Operation to lockout (oplockout)	Set oplockout = NUM OF RECL. GND +1
7136	NUM OF RECL. PH	Phase Reclosing	Operation to lockout (oplockout)	Set oplockout = NUM OF RECL. PH +1
7150	50-1	Phase Reclosing	"50-1" row	In the "Logic" tab page <sup>1</sup>
7151	50N-1	Ground Reclosing	"50-1" row	In the "Logic" tab page <sup>1</sup>
7152	50-2	Phase Reclosing	"50-2" row	In the "Logic" tab page <sup>1</sup>
7153	50N-2	Ground Reclosing	"50-2" row	In the "Logic" tab page <sup>1</sup>
7154	51	Phase Reclosing	"51" row	In the "Logic" tab page <sup>1</sup>
7155	51N	Ground Reclosing	"51" row	In the "Logic" tab page <sup>1</sup>
7156	67-1	Phase Reclosing	"67-1" row	In the "Logic" tab page <sup>1</sup>
7157	67N-1	Ground Reclosing	"67-1" row	In the "Logic" tab page <sup>1</sup>
7158	67-2	Phase Reclosing	"67-2" row	In the "Logic" tab page <sup>1</sup>
7159	67N-2	Ground Reclosing	"67-2" row	In the "Logic" tab page <sup>1</sup>
7160	67	Phase Reclosing	"67" row	In the "Logic" tab page <sup>1</sup>
7161	67N	Ground Reclosing	"67" row	In the "Logic" tab page <sup>1</sup>
7200	bef.1.Cy:50-1	Phase Reclosing	"50-1" first column	In the "Logic" tab page
7201	bef.1.Cy:50N-1	Ground Reclosing	"50-1" first column	In the "Logic" tab page
7202	bef.1.Cy:50-2	Phase Reclosing	"50-2" first column	In the "Logic" tab page
7203	bef.1.Cy:50N-2	Ground Reclosing	"50-2" first column	In the "Logic" tab page
7204	bef.1.Cy:51	Phase Reclosing	"51" first column	In the "Logic" tab page
7205	bef.1.Cy:51N	Ground Reclosing	"51" first column	In the "Logic" tab page
7206	bef.1.Cy:67-1	Phase Reclosing	"67-1" first column	In the "Logic" tab page
7207	bef.1.Cy:67N-1	Ground Reclosing	"67-1" first column	In the "Logic" tab page
7208	bef.1.Cy:67-2	Phase Reclosing	"67-2" first column	In the "Logic" tab page
7209	bef.1.Cy:67N-2	Ground Reclosing	"67-2" first column	In the "Logic" tab page
7210	bef.1.Cy:67 TOC	Phase Reclosing	"67" first column	In the "Logic" tab page
7211	bef.1.Cy:67NTOC	Ground Reclosing	"67" first column	In the "Logic" tab page
7212	bef.2.Cy:50-1	Phase Reclosing	"50-1" second column	In the "Logic" tab page
7213	bef.2.Cy:50N-1	Ground Reclosing	"50-1" second column	In the "Logic" tab page
7214	bef.2.Cy:50-2	Phase Reclosing	"50-2" second column	In the "Logic" tab page
7215	bef.2.Cy:50N-2	Ground Reclosing	"50-2" second column	In the "Logic" tab page
7216	bef.2.Cy:51	Phase Reclosing	"51" second column	In the "Logic" tab page
7217	bef.2.Cy:51N	Ground Reclosing	"51" second column	In the "Logic" tab page
7218	bef.2.Cy:67-1	Phase Reclosing	"67-1" second column	In the "Logic" tab page
7219	bef.2.Cy:67N-1	Ground Reclosing	"67-1" second column	In the "Logic" tab page
7220	bef.2.Cy:67-2	Phase Reclosing	"67-2" second column	In the "Logic" tab page
7221	bef.2.Cy:67N-2	Ground Reclosing	"67-2" second column	In the "Logic" tab page
7222	bef.2.Cy:67 TOC	Phase Reclosing	"67" second column	In the "Logic" tab page
7223	bef.2.Cy:67NTOC	Ground Reclosing	"67" second column	In the "Logic" tab page
7224	bef.3.Cy:50-1	Phase Reclosing	"50-1" third column	In the "Logic" tab page
7225	bef.3.Cy:50N-1	Ground Reclosing	"50-1" third column	In the "Logic" tab page
7226	bef.3.Cy:50-2	Phase Reclosing	"50-2" third column	In the "Logic" tab page
7227	bef.3.Cy:50N-2	Ground Reclosing	"50-2" third column	In the "Logic" tab page

<sup>1</sup> Set all elements equal to *Lockout* when the relay setting is "Stops 79"

Address	Relay Setting	Model block	Model setting	Note
7228	bef.3.Cy:51	Phase Reclosing	"51" third column	In the "Logic" tab page
7229	bef.3.Cy:51N	Ground Reclosing	"51" third column	In the "Logic" tab page
7230	bef.3.Cy:67-1	Phase Reclosing	"67-1" third column	In the "Logic" tab page
7231	bef.3.Cy:67N-1	Ground Reclosing	"67-1" third column	In the "Logic" tab page
7232	bef.3.Cy:67-2	Phase Reclosing	"67-2" third column	In the "Logic" tab page
7233	bef.3.Cy:67N-2	Ground Reclosing	"67-2" third column	In the "Logic" tab page
7234	bef.3.Cy:67 TOC	Phase Reclosing	"67" third column	In the "Logic" tab page
7235	bef.3.Cy:67NTOC	Ground Reclosing	"67" third column	In the "Logic" tab page
7236	bef.4.Cy:50-1	Phase Reclosing	"50-1" fourth column	In the "Logic" tab page
7237	bef.4.Cy:50N-1	Ground Reclosing	"50-1" fourth column	In the "Logic" tab page
7238	bef.4.Cy:50-2	Phase Reclosing	"50-2" fourth column	In the "Logic" tab page
7239	bef.4.Cy:50N-2	Ground Reclosing	"50-2" fourth column	In the "Logic" tab page
7240	bef.4.Cy:51	Phase Reclosing	"51" fourth column	In the "Logic" tab page
7241	bef.4.Cy:51N	Ground Reclosing	"51" fourth column	In the "Logic" tab page
7242	bef.4.Cy:67-1	Phase Reclosing	"67-1" fourth column	In the "Logic" tab page
7243	bef.4.Cy:67N-1	Ground Reclosing	"67-1" fourth column	In the "Logic" tab page
7244	bef.4.Cy:67-2	Phase Reclosing	"67-2" fourth column	In the "Logic" tab page
7245	bef.4.Cy:67N-2	Ground Reclosing	"67-2" fourth column	In the "Logic" tab page
7246	bef.4.Cy:67 TOC	Phase Reclosing	"67" fourth column	In the "Logic" tab page
7247	bef.4.Cy:67NTOC	Ground Reclosing	"67" fourth column	In the "Logic" tab page

## 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 trip element ("Output Logic" block).
- One closing element ("Closing Logic" block).

### 3.3.2 Functionality

The "Output Logic" block collects the trip signals coming from the protective elements and operates the relay output contact. The "Closing Logic" block controlled by the reclosing feature ("Phase Reclosing" and "Ground Reclosing" block) has the purpose of generating a closing command for the power breaker when a reclosing attempt is triggered. The available output contacts are *Trip* (operated by the "Output Logic" block) and *Close* (operated by the "Closing Logic" block) .

### 3.3.3 Data input

To disable the relay model ability to open the power circuit breaker simply disable the "Output Logic" block.

To disable the relay model ability to close the power circuit breaker simply disable the "Closing Logic" block.

## 4 Features not supported

The following features are not supported:

- 50 1Ph-1 and 50 1Ph-2 element.
- Sensitive earth fault elements.
- Dynamic cold load pickup.
- 2<sup>nd</sup> harmonic blocking.
- Start inhibit for motors (66/68).
- Motor starting protection(48).
- Breaker failure protection (50BF).
- Synchrocheck (25).

## 5 References

- [1] Siemens AG, Wittelsbacherplatz 2, 80333 Munich, Germany. *SIPROTEC Multi-Functional Protective Relay with Local Control 7SJ62/63/64 V4.6 Manual C53000-G1140-C147-6*, 2004.
- [2] Siemens AG, Wittelsbacherplatz 2, 80333 Munich, Germany. *SIPROTEC Multi-Functional Protective Relay with Local Control 7SJ62/64 V4.7 Manual C53000-G1140-C207-3 Release date 02.2009*, 2009.