



POWERFACTORY

PowerFactory 2021

Technical Reference

ABB SACE ISOMAX S1-S8

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POWER SYSTEM SOLUTIONS
MADE IN GERMANY

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1 Model information

Manufacturer ABB SACE

Model ISOMAX S1-S8

Variants These PowerFactory relay model types simulate the different firmware and hardware versions of the ABB SACE ISOMAX S1-S8 Low Voltage breakers.

2 General description

The ABB SACE ISOMAX is a family of moulded-case circuit-breakers with advanced performance/size ratio. Different models are available for rated current from 16 to 1600 A.

The simplest ABB SACE ISOMAX S1-S8 LVBRs like the S1, S2 and S3 are protection assemblies containing a phase over current thermic element, and a magnetic instantaneous element. Isomax S5, and S6 can be also be equipped with the PR211, and PR212 electronic trip units. Isomax S4, S7, and S8 contains only a PR211 or a PR212 electronic trip units.

The ABB SACE ISOMAX S1-S8 LVBRs have been modeled using the following 42 PowerFactory relay models which include most of the features available in this family of low voltage breakers:

- SACE ISOMAX S1
 - SACE ISOMAX S1 125 R10-16 Im160-500
 - SACE ISOMAX S1 125 R20-40 Im200-500
 - SACE ISOMAX S1 125 R50 Im250-500
 - SACE ISOMAX S1 125 R63 Im320-630
 - SACE ISOMAX S1 125 R80 Im400-800
 - SACE ISOMAX S1 125 R100 Im500-1000
 - SACE ISOMAX S1 125 R125 Im630-1250
- SACE ISOMAX S2
 - SACE ISOMAX S2 160 R12.5-16 Im160-500
 - SACE ISOMAX S2 160 R20-40 Im200-500
 - SACE ISOMAX S2 160 R50 Im250-500
 - SACE ISOMAX S2 160 R63 Im320-630
 - SACE ISOMAX S2 160 R80 Im400-800
 - SACE ISOMAX S2 160 R100 Im500-1000
 - SACE ISOMAX S2 160 R125 Im630-1250
 - SACE ISOMAX S2 160 R160 Im800-1600
- SACE ISOMAX S3
 - SACE ISOMAX S3 160 R12.5-16 Im160-500

- SACE ISOMAX S3 160 R32 Im160-320
- SACE ISOMAX S3 160 R50 Im250-500
- SACE ISOMAX S3 160 R63 Im320-630
- SACE ISOMAX S3 160 R80 Im400-800
- SACE ISOMAX S3 160 R100 Im500-1000
- SACE ISOMAX S3 160 R125 Im630-1250
- SACE ISOMAX S3 160 R160 Im800-1600
- SACE ISOMAX S3 250 R200 Im2000
- SACE ISOMAX S3 250 R250 Im2500
- SACE ISOMAX S4
 - SACE ISOMAX S4 PR211/P
 - SACE ISOMAX S4 PR212/P
- SACE ISOMAX S5
 - SACE ISOMAX S5 400 R320 Im3200
 - SACE ISOMAX S5 400 R400 Im4000
 - SACE ISOMAX S5 630 R500 Im5000
 - SACE ISOMAX S5 630 R630 Im6300
 - SACE ISOMAX S5 PR211/P
 - SACE ISOMAX S5 PR212/P
- SACE ISOMAX S6
 - SACE ISOMAX S6 630 R500 Im5000
 - SACE ISOMAX S6 630 R630 Im6300
 - SACE ISOMAX S6 800 R800 Im8000
 - SACE ISOMAX S6 PR211/P
 - SACE ISOMAX S6 PR212/P
- SACE ISOMAX S7
 - SACE ISOMAX S7 PR211/P
 - SACE ISOMAX S7 PR212/P
- SACE ISOMAX S8
 - SACE ISOMAX S8 PR211/P
 - SACE ISOMAX S8 PR212/P

The model implementation has been based on the information available in the low voltage breaker documentation provided by the manufacturer and freely available [1].

For more information regarding the *SACE PR211* and the *SACE PR212* please refer to specific technical references.

3 Supported features

3.1 Measurement and acquisition & input signals

It represents the interface between the power system and the Low Voltage Breaker protective elements. The currents flowing in the power system are converted by an element simulating a 3 phase CT; the secondary currents are then measured by a three phase and neutral measurement element which models the data acquisition of the relay.

3.1.1 Available Units

- one 3 phase current transformer ("Ct" block).
- one 3 phase measurement element ("Measure" block).

3.1.2 Functionality

The "Ct" 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.

3.1.3 Data input

The ratio of the "Ct" must be 1/1.

The Low Voltage Breaker primary rated current value must be set in the current measurement element ("Measure" block, "*Nominal current*" parameter). The following values are available:

SACE ISOMAX S1 125 R10-16 Im160-500 :

- 10
- 12.5
- 16

SACE ISOMAX S1 125 R20-40 Im200-500 :

- 20
- 25
- 32
- 40

SACE ISOMAX S1 125 R50 Im250-500 :

- 50

SACE ISOMAX S1 125 R63 Im250-500 :

- 63

SACE ISOMAX S1 125 R80 Im250-500 :

- 80

SACE ISOMAX S1 125 R100 Im500-1000 :

- 100

SACE ISOMAX S1 125 R125 Im630-1250 :

- 125

SACE ISOMAX S2 160 R12.5-16 Im160-500 :

- 12.5
- 16

SACE ISOMAX S2 160 R20-40 Im200-500 :

- 20
- 25
- 32
- 40

SACE ISOMAX S2 160 R50 Im250-500 :

- 50

SACE ISOMAX S2 160 R63 Im320-630 :

- 63

SACE ISOMAX S2 160 R80 Im400-800 :

- 80

SACE ISOMAX S2 160 R100 Im500-1000 :

- 100

SACE ISOMAX S2 160 R125 Im630-1250 :

- 125

SACE ISOMAX S2 160 R160 Im800-1600 :

- 160

SACE ISOMAX S3 160 R12.5-16 Im160-500 :

- 12.6
- 16

SACE ISOMAX S3 160 R32 Im160-320 :

- 32

SACE ISOMAX S3 160 R50 Im250-500 :

- 50

SACE ISOMAX S3 160 R63 Im320-630 :

- 63

SACE ISOMAX S3 160 R80 Im400-800 :

- 80

SACE ISOMAX S3 160 R100 Im500-1000 :

- 100

SACE ISOMAX S3 160 R125 Im630-1250 :

- 125

SACE ISOMAX S3 160 R160 Im800-1600 :

- 160

SACE ISOMAX S3 250 R200 Im2000 :

- 200

SACE ISOMAX S3 250 R250 Im2500 :

- 250

SACE ISOMAX S5 400 R320 Im3200 :

- 320

SACE ISOMAX S5 400 R400 Im4000 :

- 400

SACE ISOMAX S5 630 R500 Im5000 :

- 500

SACE ISOMAX S5 630 R630 Im6300 :

- 630

SACE ISOMAX S6 630 R500 Im5000 :

- 500

SACE ISOMAX S6 630 R630 Im6300 :

- 630

SACE ISOMAX S6 800 R800 Im8000 :

- 800

3.2 Protective elements

When the assembly contains an electromagnetic unit, the model consists of an inverse time and a definite time 3 phase overcurrent element. Two single phase elements, identical to the 3 phase elements, model the neutral current monitoring available in the 4 wires versions of the Tmax LVBRs family.

When an electronic trip unit is present, the model consists of one long time (inverse time), one short time (inverse or time defined), and one instantaneous element. Also in this case a set of single phase elements identical to the 3 phase elements protect the neutral conductor.

3.2.1 Available Units

PR211 and PR212

- one 3 phase inverse time overcurrent element ("L" block).
- one 3 phase definite/inverse time overcurrent element ("S" block) only in the electronic trip units.
- one 3 phase definite time overcurrent element ("I" block).
- one single phase inverse time ground overcurrent element ("G" block).

Thermomagnetic units

- one 3 phase inverse time overcurrent element ("T" block).
- one single phase inverse time neutral overcurrent element ("TN" block).
- one 3 phase definite time overcurrent element ("M" block).
- one single phase definite time neutral overcurrent element ("MN" block).

3.2.2 Functionality

All the inverse characteristics available in the Low voltage breaker are supported by the inverse time overcurrent element.

The thermo magnetic characteristics have been digitized and the relevant point sets inserted in the PowerFactory database. Different digitized curves are available for the *minimum trip* characteristic (minimum time required to detect and remove the fault) and the *max clear* characteristic (maximum time required to remove the fault). Additionally, due to the thermal characteristic of the element two set of curves are available. The user must select in the "L" dialog if the *Hot* or the *Cold* trip characteristics should be used. The *Cold* trip characteristic is intended to be used when the thermal effects of the current disappeared, the *Hot* trip characteristic represents the trip times when the prefault current is equal to the device rated current. The active trip characteristic must be manually selected by the user.

The trip equations available in the electronic trip units documentation have been inserted in the models including the trip tolerance.

The following tolerances are used in the ABB SACE ISOMAX S1-S8 model with thermo magnetic unit:

L Tolerance depending up on the digitized curves.

I Trip Threshold tolerance $\pm 20\%$, Trip Time tolerance 40 ms.

The following tolerances are used in the ABB SACE ISOMAX S1-S8 model when an electronic trip unit is use:

L Trip Threshold tolerance 105%-130% I_1 , Trip Time tolerance $\pm 10\%$.

S *S-Curve* trip curve: Trip Threshold tolerance $\pm 10\%$ I1, Trip Time tolerance $\pm 20\%$.

I Trip Threshold tolerance $\pm 20\%$. Max trip time tolerance 0.02 s.

G Trip Threshold tolerance $\pm 20\%$ I1, Trip Time tolerance $\pm 20\%$.

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 Parameter	Note
	Thermal Trip Threshold	T	Current Setting (Ipset)	
		TN	Current Setting (Ipset)	
	Thermal Trip Time	T	Time Dial (Tpset)	
		TN	Time Dial (Tpset)	
	Magnetic element Disabling	M	Out of Service (outserv)	
		MN	Out of Service (outserv)	
	Magnetic element Trip Threshold	M	Current Setting (Ipset)	
		MN	Current Setting (Ipset)	
	L Trip Threshold	L	Current Setting (Ipset)	
	L Trip Curves	L	Characteristic (pcharac)	
	L Trip Time	L	Time Dial (Tpset)	
	S Trip Threshold	S	Current Setting (Ipset)	
	S Trip Curves ($I^2t = \text{const}$ or $t = \text{const}$)	S	Characteristic (pcharac)	
	S Trip Time	S	Time Dial (Tpset)	
	I Trip Threshold	I	Pickup Current (Ipset)	
	G Trip Threshold	G	Current Setting (Ipset)	
	G Trip Time	G	Time Dial (Tpset)	

No user input is required in the neutral overcurrent elements which must manually disabled by the use if the LVBR version is a 3 wires LVBR.

3.3 Output logic

It represents the output stage of the low voltage breaker.

3.3.1 Available Units

- one output element ("Logic" block).
- one output signal ("yout" signal)

3.3.2 Functionality

The "Logic" block collects the trip signals coming from the protective functions; it operates the low voltage breaker power contact using the "yout" trip signal.

3.3.3 Data input

To disable completely the low voltage breaker model ability to open the power circuit disable the "Logic" block.

4 References

- [1] ABB SACE S.p.A., Divisione Interruttori B.T., Via Baioni, 35 - 24123 Bergamo - Italy. *Catalogo tecnico SACE Isomax Sinterruttori automatici scatolati di bassa tensione 604050/002 it.*